MARCH 18th 1943

FLIGHT

and

AIRCRAFT ENGINEER

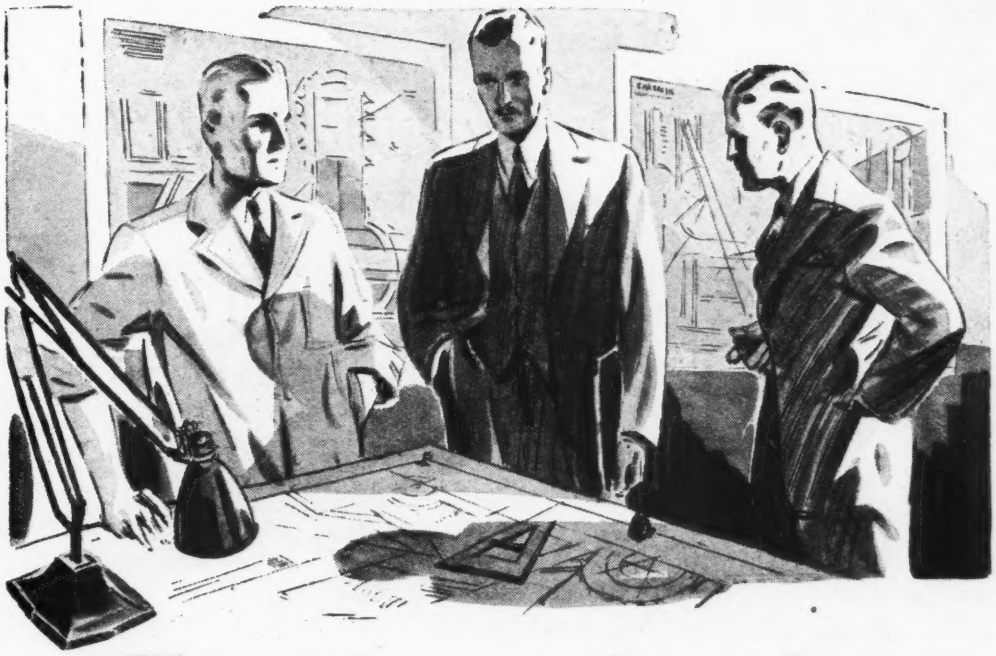
OFFICIAL ORGAN OF THE ROYAL AERO CLUB ONE SHILLING

SMITHSONIAN INSTITUTION
APR 1 - 1946
LANGLEY AERONAUTICAL LIBRARY

WON'T IT LOOK GRAND...
The Portsmouth Aviation Aerocar with
TITANINE
– the finishing touch
TITANINE LIMITED COLINDALE LONDON N.W.9
LICENSEES IN CANADA: TELEPHONE COLINDALE 8133
INTERNATIONAL PAINTS (CANADA) LTD. 6700 PARK AVENUE MONTREAL

We don't give ourselves Bouquets, it was our customers who first used the term "Habershon Quality" to indicate that they needed the finest Strip Steel available

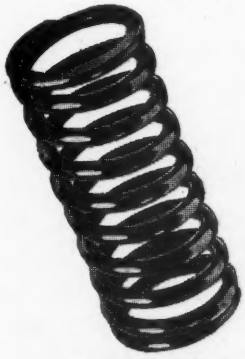
STRIP STEEL
FOR ALL PURPOSES
by
HABERSHON
ROTHERHAM



"Terry's saved us days on this Spring job"

It's surprising the time and money we, at Terry's, *can* save on Spring production if we are given the opportunity to advise on design at the beginning of the job.

At your disposal is over 90 years of practical experience in the production of Springs and Presswork for increasingly specialised purposes. So it is almost sure that our research department, in a chat over your drawing board, can be of practical help.



TERRY'S *for* **SPRINGS**

FAMOUS FOR SPRINGS & PRESSWORK SINCE 1855

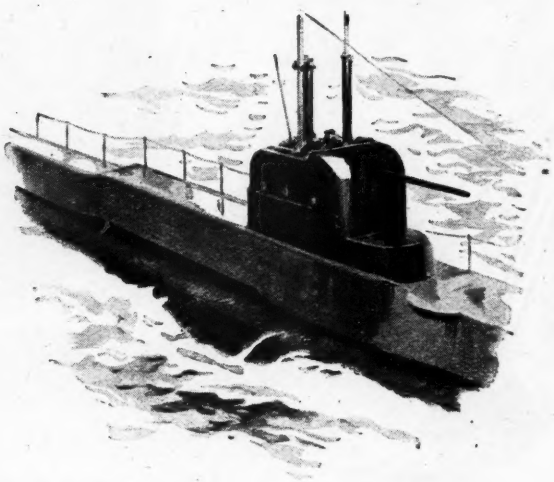
HERBERT TERRY & SONS LTD. REDDITCH, ENGLAND

Also at LONDON · BIRMINGHAM · MANCHESTER

A

It concerned the ship's safety

—SO THEY CALLED US IN



It was a knotty problem difficult to get round, and one which involved the safety of ship and crew. Remembering our great success with compressed air in the aircraft field, they called us in. This early consultation overcame all difficulties, time was saved, endless trouble avoided. It was a " hush-hush " job about which the full story cannot yet be told, but a most important contribution to our war effort was made. You, too, may have a troublesome problem which pneumatics can solve. Can we help you?

Hymatic

COMPRESSED AIR EQUIPMENT

RESEARCH · DEVELOPMENT · PRODUCTION

Basic HYMATIC developments, which have been of vital importance in war equipment, include small-capacity Air Compressors up to 1,400 lb., Electro-pneumatic Controls, Air-actuated Mechanisms, Pneumatic Rams, Oil and Water Separators, Reducing Valves, and Air Starting Equipment.

THE HEYWOOD COMPRESSOR CO. LTD., REDDITCH, ENGLAND

H.C.13/45

An Important Announcement by

AIRWORK
LIMITED

The Airwork sales organisation have placed orders for well over half a million pounds worth of aircraft and are therefore able to offer early delivery to airline operators and private owners all over the world.

CHARTER COMPANIES AND PRIVATE OWNERS SHOULD NOTE THAT AIRWORK CAN OFFER EARLIEST POSSIBLE DELIVERIES OF AIRSPEED OXFORDS, CONVERTED FOR CIVIL USE.

Airwork Limited does not deal exclusively with any one manufacturer's products, and is therefore free to offer completely unbiased advice to its clients—whether regarding the largest air liner or the smallest personal plane. Telephone Hounslow 5451.

Airwork Services include:

- Air Transport Contracting.
- Sale and purchase of new and second-hand aircraft.
- Operation and management of flying schools and clubs.
- Fly-yourself and air-taxi hire.

AIRWORK
LIMITED

WESTBROOK HOUSE, BATH ROAD, HOUNSLOW, MIDDLESEX
HOUNSLOW 5451

The **FREIGHTER**, powered by two Bristol Hercules engines equipped with

Hobson
R·A·E

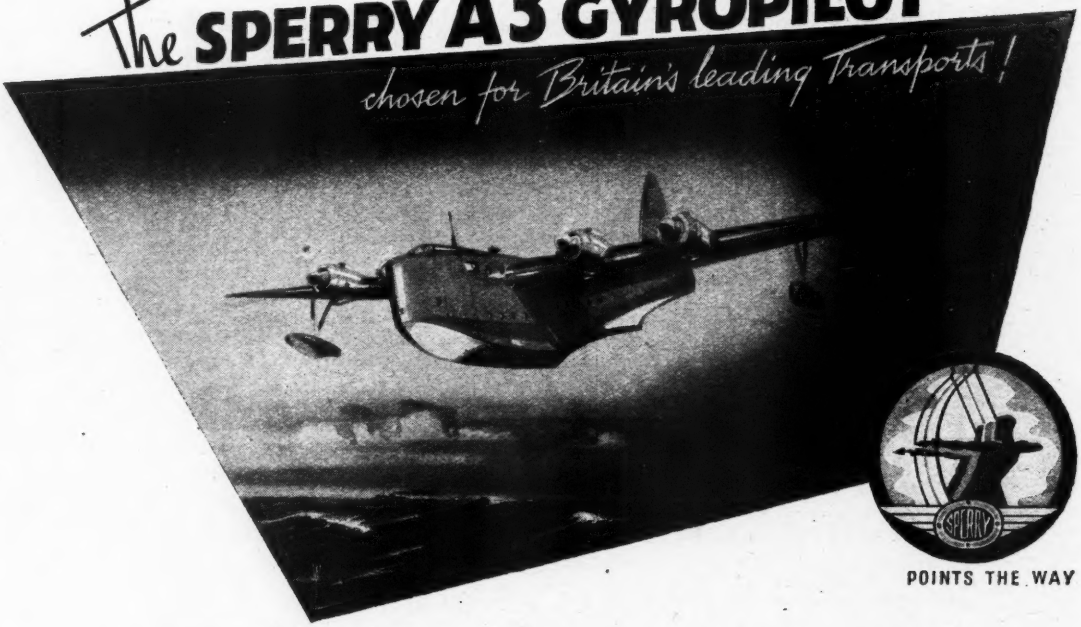
MASTER CONTROL INJECTORS

fulfils with utmost reliability and maximum fuel economy, the ever growing demand for air transport

H. M. HOBSON (AIRCRAFT & MOTOR) COMPONENTS LTD.
(Licensees in U.S.A. and Canada, Simmonds Aerocessories Inc.)

The SPERRY A3 GYROPILOT

chosen for Britain's leading Transports!



POINTS THE WAY

SHORT "SHETLAND." Fastest flying-boat in the world. Great endurance and load carrying capacity combined with high cruising speed make the "Shetland" eminently suitable for trans-oceanic operation. **ESSENTIALLY SPERRY EQUIPPED.**

THE SPERRY GYROSCOPE COMPANY LIMITED GREAT WEST ROAD BRENTFORD

S O L E N T

The Civil version of the new Seaford Flying Boat — notable for speed, range and capacity. Another superb aircraft by

Shorts

ESTABLISHED 1908

THE FIRST MANUFACTURERS OF AIRCRAFT IN THE WORLD

SHORT BROS. (R. & B.) LTD.
ROCHESTER

SHORT & HARLAND LTD.
BELFAST

FOR AIRCRAFT

Makers of Scientific Instruments for over 80 years.

SHORT & MASON, LTD.

THE INSTRUMENT HOUSE, Walthamstow, London, E.17

Telephone: LARkswood 3371/6. Telegrams: Aneroid, 'Phone, London

Look for the mark S & M

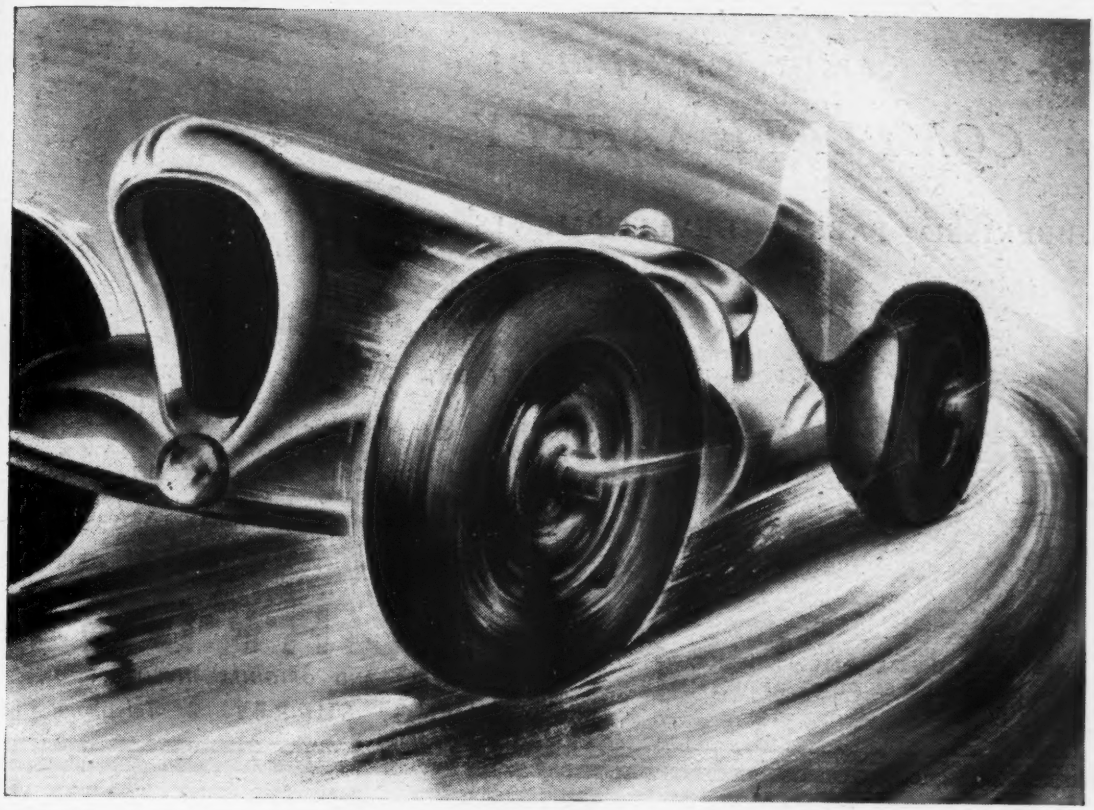
ALL TANGLED UP....

We can help you disentangle your problems. Send us your inquiries for TOOLING, JIGS, FIXTURES, PRESS TOOLS, etc,

★ CAN SOLVE YOUR POST-WAR TOOL PROBLEMS

PAPWORTH LTD

BRISTOL 'Phone: 77414



Curves at speed

Even when following unusual curves or shapes the B & D 'LECTRO-SHEAR' will quickly cut up to 16 gauge in steel, and more in softer materials. The 'Lectro-Shear' will work to a minimum radius of ¼" and its smooth powerful action leaves a clean undamaged edge to the metal. Cut curves at speed with the B & D 'Lectro-Shear'—it is one of the wide range of B & D Tools that save time, labour and operator fatigue.

Obtainable only from B & D Distributors

BLACK & DECKER

PORTABLE ELECTRIC TOOLS

BLACK & DECKER LTD · HARMONDSWORTH · MIDDLESEX

'Phone: West Drayton 2681/6 'Grams: "Blacdeck," West Drayton

BRANCH SERVICE STATIONS: LONDON, BIRMINGHAM, BRISTOL, GLASGOW, LEEDS, MANCHESTER, NOTTINGHAM

Smee's

Air-Sea Rescue Equipment for COMPLETE SAFETY

RUBBERISED FABRIC DEVELOPMENTS *BY* R·F·D LTD COMPANY

PNEUMATIC EQUIPMENT DESIGNED AND MADE TO SPECIAL REQUIREMENTS

AIRCRAFT DINGHIES AND FLOTATION GEAR WITH MANUAL, OR IMMERSION SWITCH OPERATING HEADS FOR AUTOMATIC INFLATION

AIR BORNE LIFE-BOATS, CANOES, FLOTATION BAGS, CO_2 INFLATION GEAR, LIFE-BELTS, BALLOONS, AIRCRAFT FABRICS

AIRCRAFT LIFTING BAGS, CANVAS HANGERS, TOW TARGETS, PARACHUTES, SAFETY HARNESS, PONTOONS, FABRIC FITTINGS

IF INFLATABLE, *consult* **R·F·D CO. LTD**

PIONEERS AND ORIGINAL INVENTORS

GODALMING, SURREY. *Telephone 1444*

Precision Engineering

Micro Finish to Specified Limits

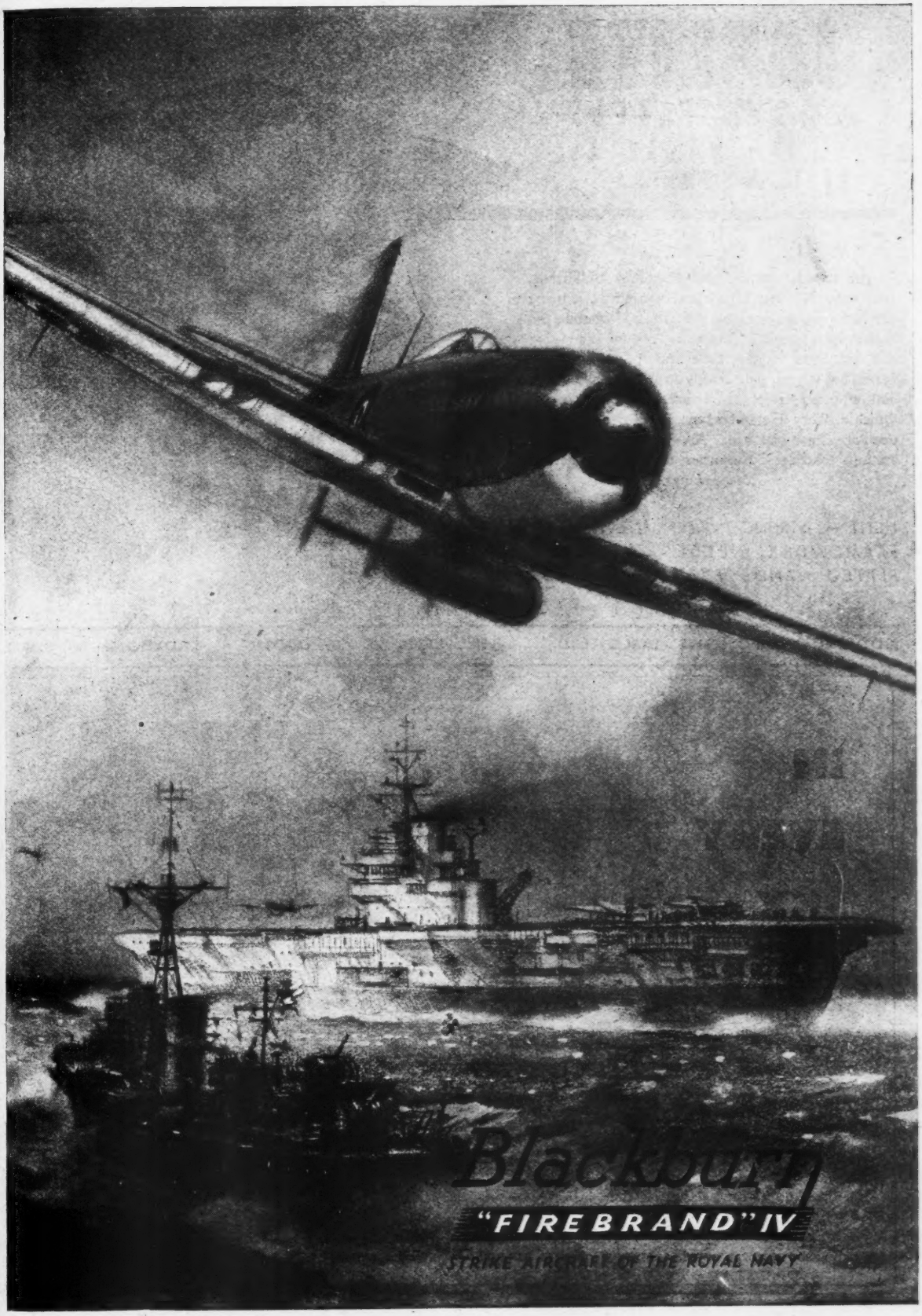
PARTS MANUFACTURED BY US FOR SABRE ENGINE

Filton Limited

Specialists In Fluid Sealing Devices

CLAPHAM ST. LEAMINGTON SPA.

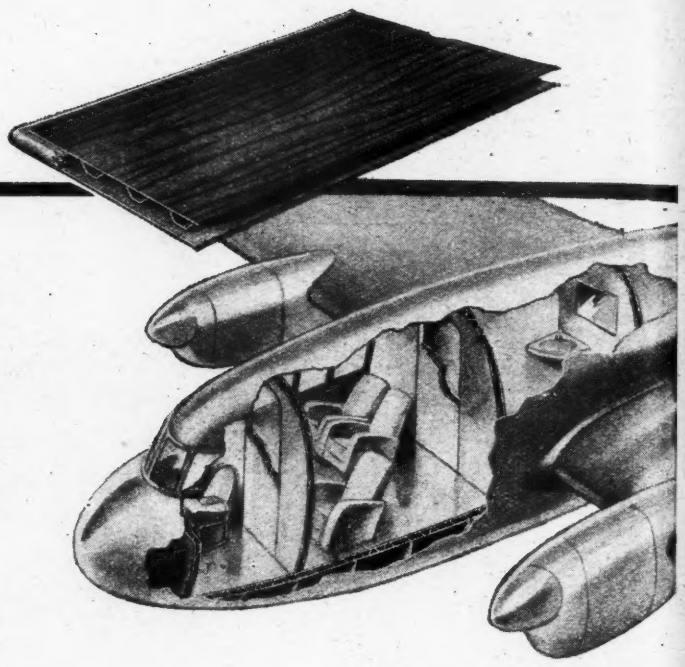
PHONE 2111-2


Blackburn
"FIREBRAND" IV
STRIKE AIRCRAFT OF THE ROYAL NAVY

JABLITE

Double Skin PANELS

. . . THE MATERIAL OF THE NEW ERA . .

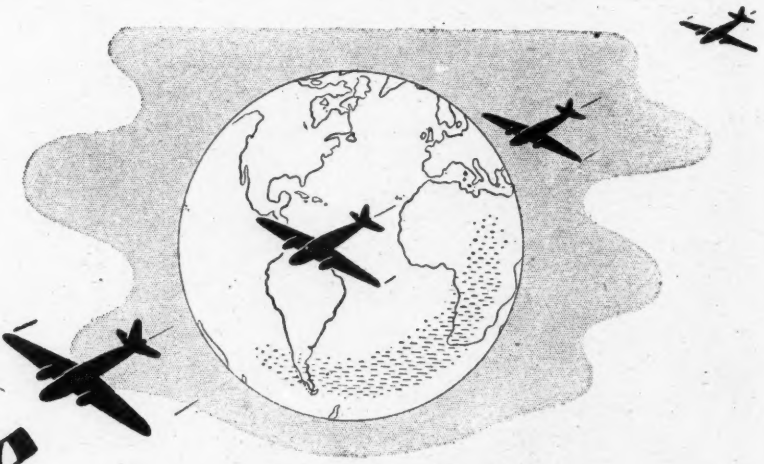


In the construction of aircraft floors, bulkheads, etc., etc., Jablite Double Skin Panels bring revolutionary advantages. First and foremost *no supporting framework is needed.* Imagine the saving this means in money, time and weight! These panels are strong, light, easily handled, easily fitted, and will not warp. Moisture and tropic proof. Quick delivery in standard sizes, with plain birch, decorative or metal face. Also available in curved sections to order. Enquiries are invited together with drawings.

LIGHT · STRONG · PERMANENT · NO FRAMEWORK NEEDED · EASILY FITTED AND AVAILABLE ***NOW***

MOULDED COMPONENTS (JABLO) LTD MILL LANE · WADDON · CROYDON · SURREY

IN EVERY SKY . . .

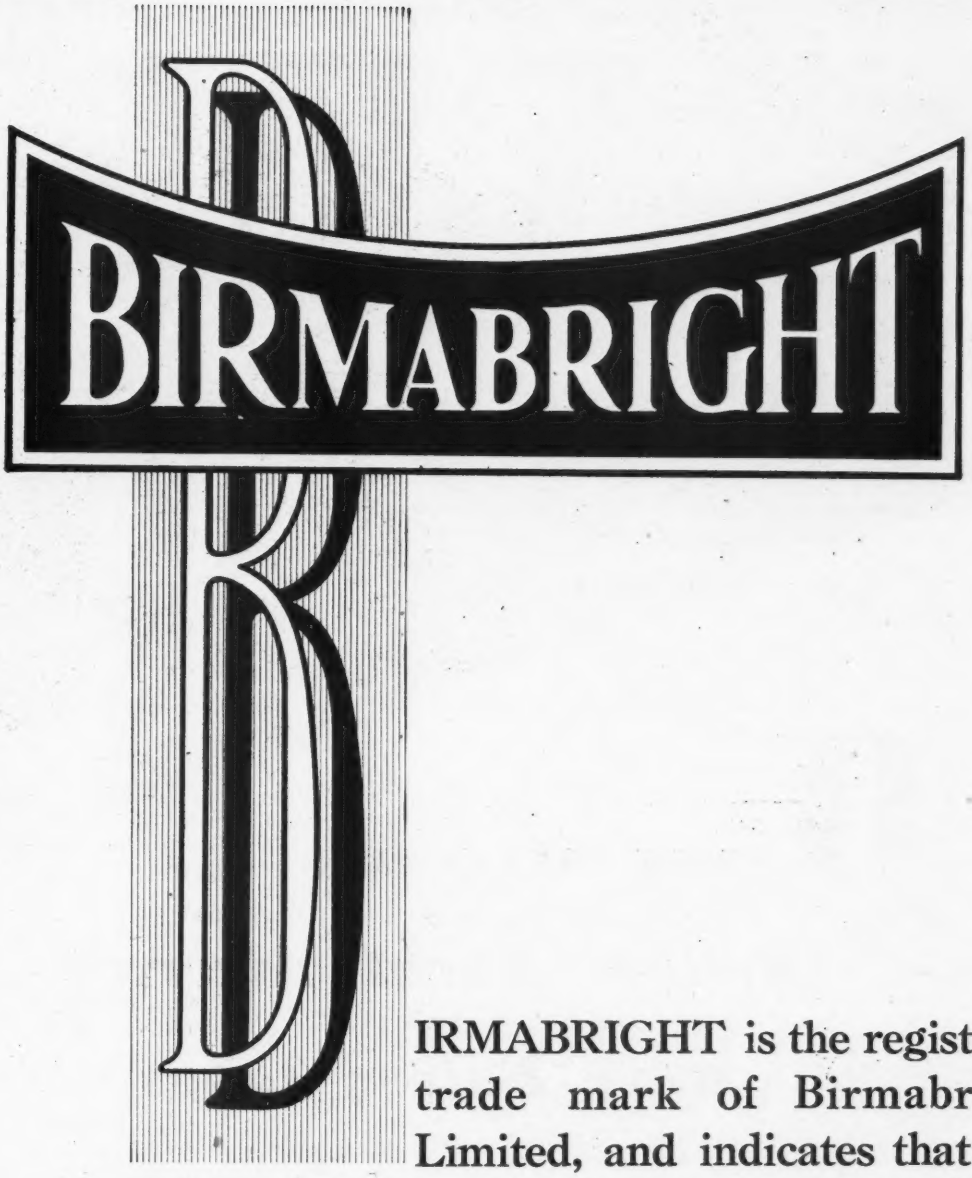


Exide

AIRCRAFT BATTERIES

THE CHLORIDE ELECTRICAL STORAGE COMPANY, LTD.,
GROSVENOR GARDENS HOUSE, GROSVENOR GARDENS, LONDON, S.W.1. · TEL.: VICTORIA 2299 'GRAMS.: CHLORIDIC, SOWEST, LONDON

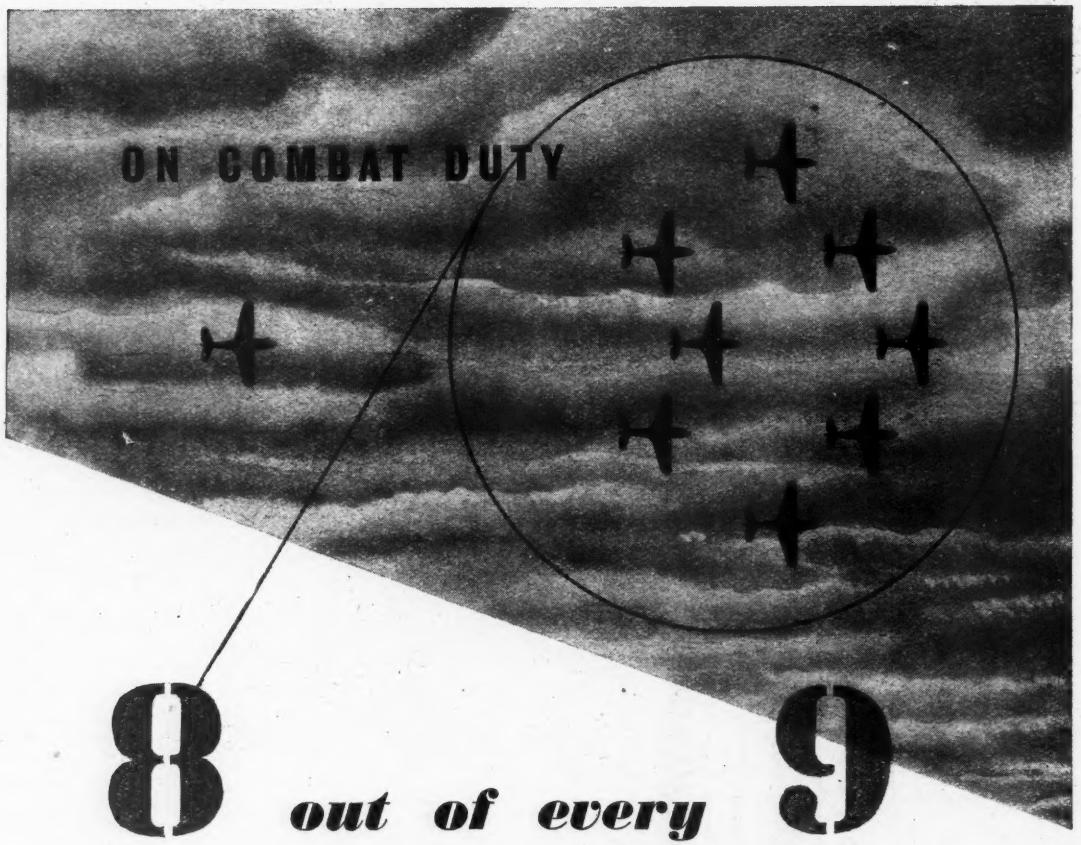
W.M8C718/43



IRMABRIGHT is the registered trade mark of Birmabright Limited, and indicates that the alloys or metal products to which it is applied are alloys manufactured by Birmabright Limited, or by registered users of the trade mark, or are products manufactured from the said alloys.

BIRMABRIGHT · LIMITED
QUINTON · BIRMINGHAM 32

RP—913B



8 out of every 9 British Naval Aircraft were Fairey types

Deeds speak louder than words. Without comment, but by no means without pride, we record one part of our contribution to the victory.

No fewer than eight out of every nine operational aircraft of British manufacture that were delivered to the Royal Navy from all sources were Fairey types.

Today, the Fairey Firefly is officially cited as "the standard two-seat Fighter Reconnaissance Aircraft in Naval Service."

THE FAIREY AVIATION COMPANY, LTD., HAYES, MIDDLESEX

FLIGHT and AIRCRAFT ENGINEER

Editorial Director G. GEOFFREY SMITH, M.B.E.
Editor - C. M. POULSEN
Assistant Editor - MAURICE A. SMITH, D.F.C. (WING CDR., R.A.F.V.R.)
Art Editor - - JOHN YOXALL

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Flightpres, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY: 8-10, CORPORATION ST. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
BIRMINGHAM, 2: GUILDHALL BUILDINGS, NAVIGATION ST. Telegrams: Autopress, Birmingham. Telephone: Midland 2971 (5 lines).
MANCHESTER, 3: 260, DEANSGATE. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.
GLASGOW, C.2: 26B, RENFIELD ST. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

SUBSCRIPTION RATES: Home and Abroad: Year, £3 1 0. 6 months, £1 10 6.

Registered at the G.P.O. as a Newspaper.

No. 1942. Vol. XLIX. March 14th, 1946 Thursdays, One Shilling.

The Outlook

Preparing for To-morrow

IN a recent leading article we asked that some temporary information, at least, should be given about any plans which have been made to cover the "third stage" in civil aircraft development. At that time we knew that at least one manufacturer had prepared preliminary designs for a really advanced turbine-driven machine, but could find no evidence to suggest that any orders had been placed for the construction of this or other prototypes. Knowing that it can take as much as three to five years to develop entirely new aircraft, we were—and still are—somewhat disturbed at the thought that there should be even the slightest apparent delay in making any necessary preparations for the less immediate future.

Although we were not then prepared to give examples, Lord Balfour, in the civil aviation debate in the House of Lords, has now given one for us. He stated that a well-known firm had submitted "particulars" of an advanced civil aircraft to the Government some eighteen months ago, but had not so far received instructions to proceed with development work on a prototype.

As "Indicator" remarked in last week's issue, new aircraft cannot be produced quickly—he cited the six-year development period required, for instance, for the Constellation—and, in any series of prototypes, there is almost certain to be a fairly high percentage of failures or near-failures.

No doubt there have been good reasons for the delay, and the firm mentioned by Lord Balfour has certainly been busy enough on the work of producing "interim" types to cover the immediate two-year period. But we hope—and there is good reason now to be believe that this hope will be fulfilled in the very near future—that some very useful development orders will be spread over the industry so that, out of the result, there may be a certain number of really outstanding British transports on our air routes before 1950.

At the moment we seem to be in the somewhat anomalous position of having turbine units ready for use but with no suitable aircraft designs, while the Americans appear to be ready with aircraft designs, but have no turbine units in production. It would provide an immense increase in our prestige if, for instance, this country could be the first to fly the Atlantic with a turbine-powered civil aircraft—even though this is not quite the simple proposition that it might at first appear to be. When flying from East to West any aircraft operating at the high altitudes necessary for turbine economy is likely to have the disadvantage of extremely strong unfavourable winds.

That is a consideration which must be faced at all times when we are thinking too casually of future high-altitude transport services. There are likely to be many occasions and many routes on which high-altitude operations will be out of the question except in so far as they are necessary to avoid bad weather and icing conditions. We are still, whether we like it or not, very much at the mercy of natural conditions—with aircraft as with any other form of transport.

The New Rates of Pay

SO far, the White Paper presenting a new pay code for officers of the three services appears to have met officially with a comparatively calm reception, and at first glance the increases in basic pay look attractive. A closer acquaintance, however, shows that the figures are not quite what they seem.

On the face of it, the prospects for, say, a married Wing Commander at the age of thirty-six or -seven are good. At that age, he will be enjoying an income of £1,150 or so a year, with the promise that, if he retires after twenty-four years service, he will receive a yearly income, on retired pay, of over £600. With figures such as these, the official assurance that the new rates are better than the old may well be accepted by a large

number of people. The rates of pay are certainly higher, and the level of the allowances satisfactory, but when one begins to consider the position of this same officer after income tax has been deducted from both pay *and* allowances, the cold hard fact is, that for some time to come he is rather worse off than under the old system wherein allowances were free of tax. Calculation of specimen incomes under the new rates, quoted on page 278, shows that, after allowing for the extra tax which has to be paid, a large majority of officers, particularly the married ones with children, are about to receive a reduction in net income.

The widely-publicized purpose of the new code is to ensure that an officer's remuneration will be adequate without any supplement from private means. Certainly, every allowance is made for those who stay alive, but there is an absence in the White Paper of any reference to the position of the wife and family of an officer who is unfortunate enough to die, or be killed during his service. Inadequate pensions are a constant cause for complaint, and in view of their importance, one would have expected some early reference to them as a form of encouragement to those temporary officers who are considering a permanent service career.

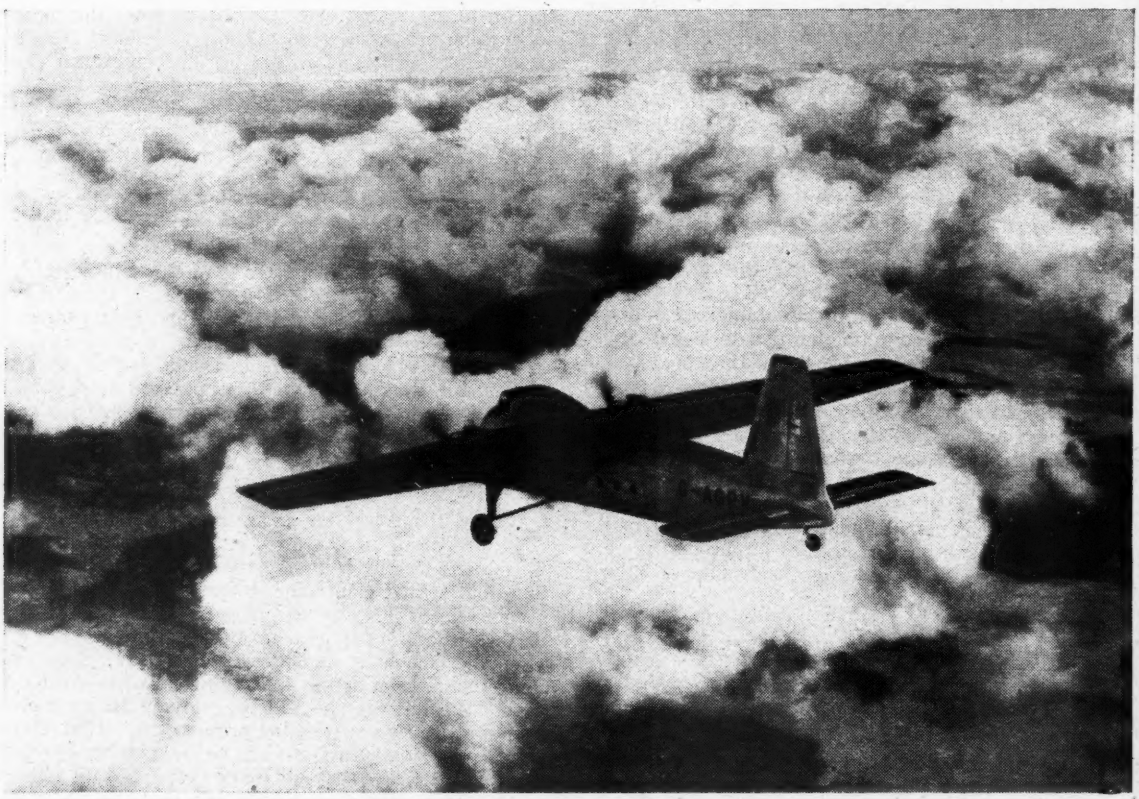
It is lamentable that, when efforts are being made to retain first-class men in the Royal Air Force, the publication of the White Paper should have been delayed until such a large number of those very officers had been released from the Service. A first-class R.A.F. officer may well be also a first-class man for industry. We know of many officers who applied for permanent commissions, but who, when their release category came round, changed their minds and left the R.A.F., because they could obtain no information whatsoever regarding future conditions of service.

The good features of the new code are that it is straightforward; it enables the potential R.A.F. officer to know where he stands; and it removes many of the inequalities which existed between the three Services.

So far as taxable allowances are concerned, one can argue that when this and that adjustment is made to income-tax rates, the serving officer is going to be better off, but for the time being arguments of this kind do not apply. It has been said that a very great improvement in conditions is brought about by this new code, but frankly, neither we, nor the R.A.F. officers with whom we have discussed these rates, can see any great change.

CONTENTS

The Outlook	255
Passenger Psychology	257
Here and There	259
Cunliffe-Owen Concordia	261
Turbine/Piston Aero Engines	262
The Monaco Engine	264
An Ingenious Light Twin	265
British Fighters To-day	*a–d*
Transatlantic Trio	267
Civil Aviation News	269
American Newsletter	270
Stress Without Strain	272
Correspondence	275
Service Aviation	277



ECONOMY IN THE AIR: The prototype Bristol 170 (Wayfarer and Freighter) on a test flight from the Bristol company's airfield at Filton.

"Indicator" Discusses Topics of the Day

Passenger Psychology

The Price of Pressurization : Considering the Farepayer's Mental Comfort : Improving Control Cabin Screen Layouts

IN this new world of pressurization—or, as it may be more euphuistically described, cabin conditioning—aircraft designers may obviously need to do a very great deal of thinking, but they will, more than ever, be in need of the advice of psychologists and interior decorators. And that is an aspect of the problem which may not have occurred to everyone. Unless the greatest possible care is taken in the layout of all future transport aircraft we may find that even those passengers who are not normally claustrophobically inclined may give up the idea of travelling by air except on most vital occasions.

The designer, of course, has troubles enough of his own. In order to make a fuselage strong enough to take the very considerable blow-out pressures involved, he is being forced to think in terms of circular or near-circular sections, and to reduce the window areas to an absolute minimum. He may even be compelled to give the crew a quite inadequate field of vision because of the difficulties involved in making that necessarily unsymmetrical shape around the nose quite strong enough. In fact, I cannot help wondering whether it would not, at least in these earlier stages of pressurization development, be simpler to leave the "flight deck" section unpressurized, and to let the crew carry on merely with oxygen supplies and with their much more practised and less sensitive eustachian tubes. There would, of course, be considerable disadvantages in this segregation, but the passengers need not know that they are cut off from the crew with an air-tight door and the stressing problems would thus be considerably simplified.

Certainly the average member of the public has no idea of the problems or of the relative pressures involved in pressurization, and I very much doubt whether the Powers who casually demand it have a very much better idea either. Perhaps it is just as well; if the passenger or the politician fully grasped the fact that there is likely to be a pressure of anything up to four tons trying, for instance, to force open the entrance door when flying at 25,000ft, each of them might think again.

Conditioning Problems

In fact, it would seem that the straightforward structural and layout problems of fuselage design and manufacture involved when dealing with blow-out loads may be the very least of those concerned with pressurization. Technically, the greatest trouble would seem to lie in the finding of ways and means by which the interior air conditions may be kept in a comfortable state. If, for instance, a cabin were to be pressurized, simple and solely, to give 8,000ft conditions at 45,000ft, the occupants might, in all but tropical summer conditions, be uncomfortable to the point of suffering severely, since the air would be quite unbearably dry. Very considerable amounts of water have to be used in any cabin conditioning plant, and the humidification must be controlled not only for the varying pressure ratios, but also to normalize the intake air condition at different heights. Quite apart from any complications involved, the weight of the necessary equipment and of the water supply, with the loss of quite a considerable degree of engine power needed to drive the compressors, provide the designer with—to use an abominably overworked word—headaches enough.

But, in spite of any technical difficulties which, whatever the high-powered public relations tycoons may tell us, are being experienced on both sides of the Atlantic, the problem will duly be solved.

The question is whether, in their pride and joy, the technicians may forget other and equally important aspects of passenger comfort involved. Somehow or other the interior decoration experts must find means of toning down the evil effects of tubular cabin shapes and small windows on the mental comfort of the passengers. It will be possible to get rid of the horrible perspectives of a circular fuselage by the simple expedient of breaking up the lines by means of a series of bulkheads. This action would reduce the available space and will add to the all-up weight, but I feel that, for any but the shortest of journeys, these sacrifices must be made if passengers are not to be discouraged. One can so easily imagine the extreme case in which an operator, in order to obtain maximum passenger capacity, might demand a hundred-passenger aircraft in which the occupants sit in serried ranks running into the far distance. Rather than travel in such an aircraft for more than a continuous period, at the very most, of two hours, I would happily travel by train, boat and coracle, or on my own feet.

Slipways

Another little matter which will need to be considered when we are thinking in terms of almost universal air travel is that of the differences in attitude of the aircraft between ground and flying conditions. The advantages of the tricycle undercarriage from the handling point of view have from time to time been sufficiently stressed, but is not so often that we hear anything much about its advantages from the passenger-comfort angle.

We have all experienced that wild struggle up a sometimes slippery aisle between the rows of seats in a conventionally-undercarriaged aircraft. With steep entrance ladders, small entrance doors, and this troublesome slope, passenger-flying can, even nowadays, be considered only as a means of travel suitable for the comparatively strong and healthy. No doubt before the multitudes are ready to fly everywhere and before the fares are low enough to permit such a doubtfully advantageous millennium, all transport aircraft will have one form or another of level-landing undercarriage. But it may still be a point worth mentioning for the benefit of those technicians who are either unconverted or doubtful, and who have every good practical reason for preferring to build their aircraft with a little wheel at the back and, sometimes, a very pronounced ground angle.

There is another little matter. After a pilot has spent the better part of six years in different kinds of military aircraft he must suffer something of a shock when he finds that the view from a civil aircraft's "flight deck"—as the control cabin is now so grandly described—is no better than it was in pre-war days, and infinitely worse than it was in his thrice accursed flying gun-platforms. There are one or two notable exceptions to the rule, but certainly the field of view from the captain's seat of the average civil aircraft, whether British or American, is shockingly bad. It is sometimes reduced, in fact, to one through a mere foot-deep transparent strip with a number of obstructing supports. It is often much too far away from the pilot's eyes, and only more or less at the right level. The roof is usually opaque and the pilot may only obtain a view forward and downward by opening a bad-weather window or by pressing his face against a side panel.

Yet this same captain, sitting in his roomful of scientific aids and controls, is expected to make decent arrivals on narrow runways, sometimes in the middle of the night and perhaps in heavy rain or border-line visibility. Sometimes the screen is curved and the view he gets may be distorted and mixed up with a lot of minor reflections from the in-

PASSENGER PYSCHOLOGY

terior. After making a beam approach through low cloud he may have no more than ten seconds in which to see the airfield, to line up the aircraft to a runway which may be off-wind and start the hold-off.

And the worse of it all is that the need for pressurization is going to make this view situation even worse than it was before. In order, as I have said before, to cope with a pressure difference which can only be taken with fair comfort by a symmetrically circular structure, the uneven shapes necessary to provide the pilot with any kind of all-round view involves the designer in a most considerable strengthenings and stiffenings in the structure—and these automatically reduce the useful range of view which the somewhat unscientific structural shape was intended to supply. So we have a vicious circle.

Obviously we shall have to think again and very hard indeed on this matter of control cabin window layout in pressurized aircraft. I believe that the manufacturers of Constellation tried half a dozen types of screen arrangement and nose-shape before eventually returning to a more or less conventional screen layout which offered the best compromise.

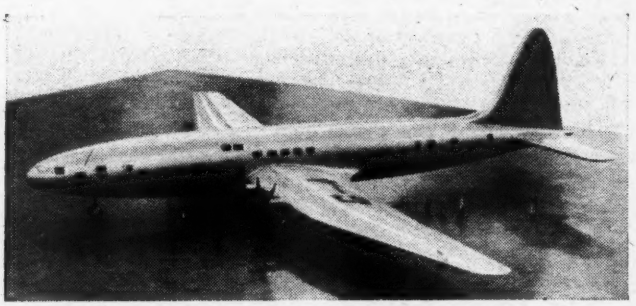
One way out of the difficulty, of course, at least with transport aircraft which are not expected to fly at really personally uncomfortable heights of 35,000ft or more, will be, as already suggested, to leave the crews' section outside the general pressurization scheme, and to offer them something a little better and more comfortable and convenient in the way of oxygen supply arrangements. A more advanced way out of the difficulty might be to organize the control compartment so that, while the shape may be symmetrical and necessarily largely devoid of forward view during the high-altitude part of the flight, it can be "opened up" by hydraulic means at all other times. Such a solution might be impractical on the face of it, but the designers of the Republic Rainbow have apparently gone part of the way with their movable screen fairing arrangement.

The "Brabazon I" Controversy

Are Big Aircraft Worth While? : All-out or Nothing

AMIDST the heckling and counter-heckling which has been going on over the Bristol 167, or "Brabazon I," one or two very important arguments in favour of the project have been overlooked. Goodness knows there is a sufficient number of good or mediocre arguments capable of being levelled against the idea of expending so much time, money and effort in the present stage of British civil aircraft development. By the time this appears in print it is probable that a decision on the question will have been officially "promulgated."

In the meantime it should be stressed that, sooner or later, the development of a really large passenger aircraft *must* be started. Now is possibly as good a time as any other for such a start. For any service such as that across the Atlantic, from capital to capital terminals, prestige will, sooner or later, demand the use of really large aircraft, and it is even probable that, uneconomic though the initial operation of such aircraft might, on paper, appear to be, they will be found to be very worth while indeed. Most of us remember the criticisms made at the suggestion that we should spend our money on still larger trans-atlantic liners of the *Queen Mary* class, yet the two liners of this class have proved their worth and have had a more than considerable prestige value in our favour. Provided that they can be successfully made and safely operated, large aircraft will eventually be worth while.



A model of the Bristol Brabazon I showing the general layout.

So that, in fact, all criticisms can be usefully reduced to those of plain technical interest. Is the Bristol 167 too great an advance in size and achievement to be attempted at the present time? Will development take so long that the design will be out of date before the production aircraft can be put into regular service?

As far as size is concerned, the problem is obviously linked up with that of airfield development—and a great deal can be done in three or four years. It is not likely that there will be so great an advance in direct navigational assistance and in means of combating ice-formation during the next few years that we shall be able definitely to guarantee an arrival at one particular airfield after every trip. There will still be diversions. So this country will need at least half a dozen airfields where a 110-tonner can be landed, taxied about, and serviced.

During the controversy far too much fuss has been made of the actual runway lengths required by the 167; in fact, it will not have a particularly high wing-loading, as such figures go nowadays, and neither the take-off nor the landing runs should be much, if any, in excess of those considered now to be normal. Runway strength and durability under such heavy running and braking loads are much more important. Unnecessary excitement has been caused by the fact that Filton, Bristol's home airfield, will need one or more better runways for the development testing of the 167. There is still plenty of time for this, provided that something is done soon. The entire question of contractors' airfield suitability—discussed by "Indicator" some time ago—is one which should be very seriously considered if we are not, in due course, to be hampered in both military and civil aircraft development.

As for the technical difficulties involved, these will undoubtedly be very great, and few people expect the 167 prototype to be flying before 1947, or even 1948, or hope the production aircraft will be in regular service before 1950 or 1951. So we must plan ahead in a very big way. As Sir Stanley White explained in a recent letter to the Press, the production 167 will certainly have turbine-airscrew power units and the use of these will alter the general situation very considerably. Coupled piston engines are being installed in the prototype only so that this can be put into the air without too much delay.

For those who shout too loudly about American progress, it may be remarked that the development of America's big civil aircraft, such as the Consolidated-Vultee 37 and the Lockheed Constitution, will undoubtedly be held up by the lack of sufficiently high-powered engines. There are, so far, no piston engines suitable for these aircraft, and it is probable that, as the British Civil Air Attaché recently stated, they will be initially flight-tested in a very under-powered state. There will then be a long delay before any production aircraft can appear. We in this country are well in advance with turbine-airscrew and jet development—on which the future of all later series of civil aircraft must depend.

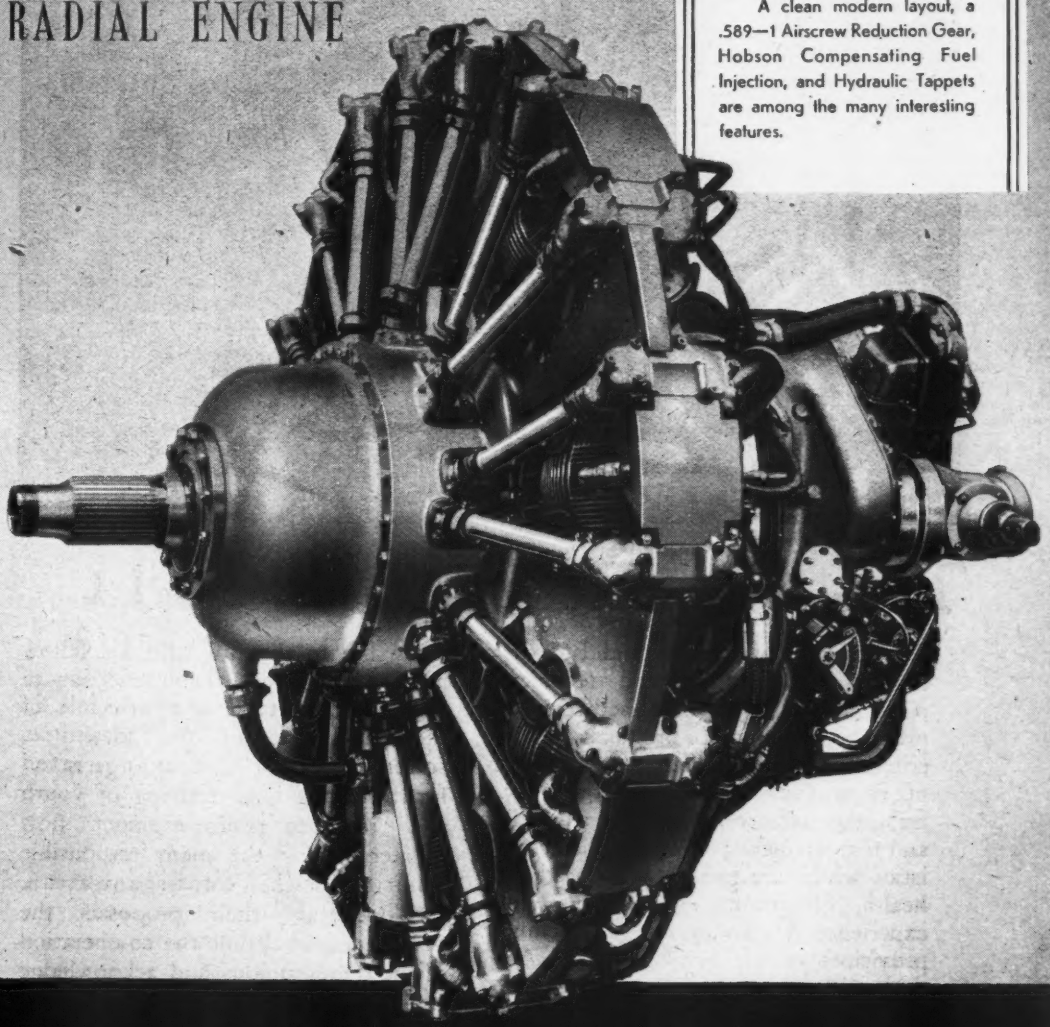
For the present, all one can say is that, if we proceed with the work on the "Brabazon I," then it must be on a very long-term basis and the aircraft must obviously be up to date in, say, 1951. Neither must we be bullied into cheese-paring on development costs. If the aircraft is worth building at all, then it is worth everything we can put into it, so that, even if it is only a "near-success" as a serious transport aircraft, so much will have been learnt that we shall be able to go right ahead with more and bigger and better projects. H. A. T.

A new

850 H.P. 9 CYL SINGLE ROW RADIAL ENGINE

THIS latest addition to the Armstrong Siddeley range of radial engines provides 850 h.p. for a weight of 1020 lbs. and a diameter of 48½ inches.

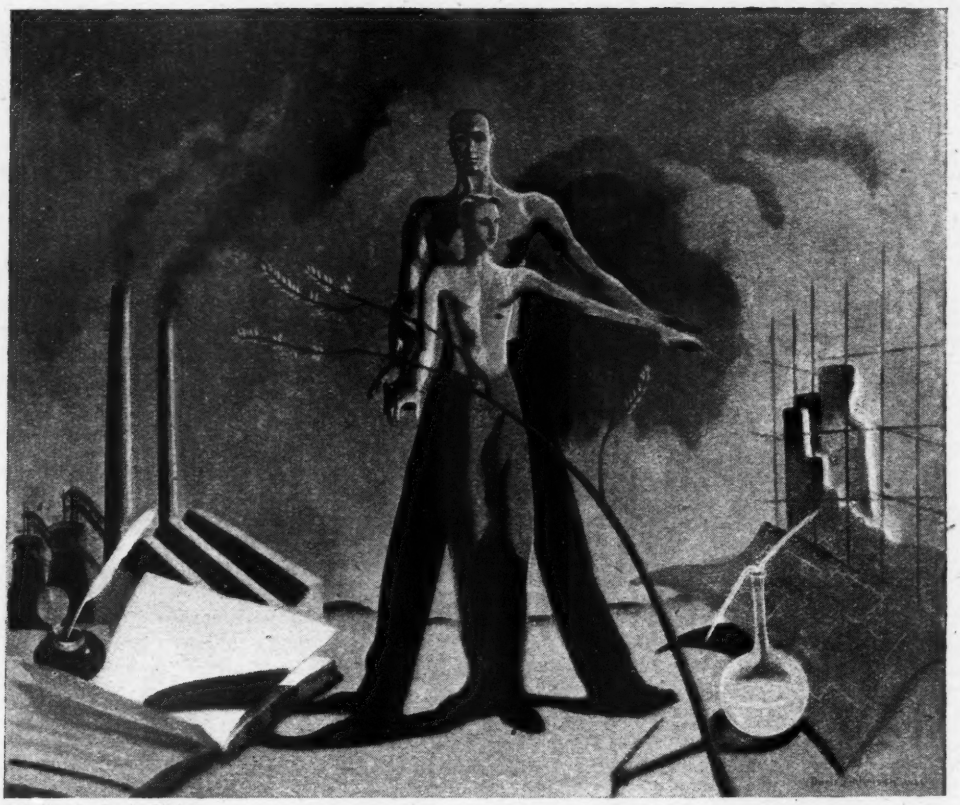
A clean modern layout, a .589—1 Airscrew Reduction Gear, Hobson Compensating Fuel Injection, and Hydraulic Tappets are among the many interesting features.



ARMSTRONG SIDDELEY

COUGAR

ARMSTRONG SIDDELEY MOTORS LTD (BRANCH OF HAWKER SIDDELEY AIRCRAFT CO. LTD.)



Painting by Doris Zinkeisen

This Present Age . . 11

The selection of suitable candidates for training for executive and technical positions in a highly organised concern presents a difficult problem. The criteria of skill and intelligence are not of themselves sufficient, as the most important factors are natural aptitude and temperament ; inherent characteristics which are greatly influenced by health, education, environment and experience. Important and far reaching provisions of the new Education Act deal with the assessment of human qualities. Education will provide the training of personality, develop habits of logical thinking and sound judgment, and thus will fit the pupil for a congenial vocational training, not merely to make a living, but to share and enjoy life to the full with his fellow men. This eventual simplification of management's task is a principle of the future, but in the meantime, schemes have been inaugurated for the occupational training of youth and others to ensure a smooth flow of recruits for the many responsible positions within our organisation. In operating their proposals the management welcome the co-operation of the trades unions and acknowledge the assistance of our Works Councils, Production Committees and other sections of the organisation in the selection and training of those whose character, abilities and energy, render them worthy of greater opportunities.

THE UNITED STEEL COMPANIES LTD

THE UNITED STEEL COMPANIES LIMITED

17, WESTBOURNE ROAD . SHEFFIELD 10

STEEL, PEECH & TOZER, SHEFFIELD
SAMUEL FOX & CO. LTD., SHEFFIELD
UNITED STRIP & BAR MILLS, SHEFFIELD

APPLEBY-FRODINGHAM STEEL CO. LTD., SCUNTHORPE
WORKINGTON IRON & STEEL CO., WORKINGTON
UNITED COKE & CHEMICALS CO. LTD., CUMBERLAND

THE ROTHERVALE COLLIERIES, TREETON
THE SHEFFIELD COAL CO. LTD., TREETON
THOS. BUTLIN & CO., WELLINGBOROUGH

U.S.P. 43

HERE AND THERE

HOLD IT! Bruce Parker, U.S. water-ski champion, at Jones Beach, New York, enjoys a mile-a-minute ride behind a Luscombe. He starts behind a fast motor boat and transfers, at speed, to the plane's tow-rope.

Showing the Roundels

A SERIES of long-distance training flights by the R.A.F. to the Dominions, India, the Mediterranean, the Middle East and the Far East are now being arranged, it was stated by Mr. John Strachey, Under-Secretary for Air, in the House last week. Several aircraft may take part in some of these flights.

This was in reply to Sir Wavell Wakefield, who suggested that, in view of the success of the *Aries*' flight to South Africa, similar flights by several aircraft instead of only one should be made elsewhere.

Quarts from Pint Pots

DR. CECIL GORDON, who has just been recruited to the Board of Trade to help in the drive for more and more exports (and, dare we hope, one or two little things for home use, too?) was the man who showed Coastal Command how to double its anti-U-boat patrols without any increase in available aircrews or equipment, by the application of scientific methods to the various operational problems involved.

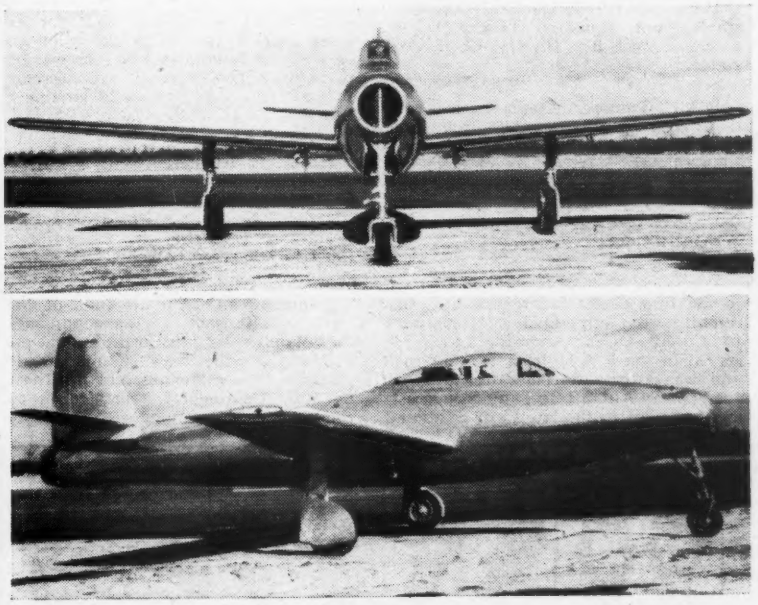
There is no reason to doubt that the methods so successfully applied in operational research for the R.A.F. during the stress of war can be equally well applied to the vital task of industrial and economic reconstruction.

Nothing New

RADAR, though a new development to mankind, is a very old technique to that homely little creature, the bat. This was mentioned by Mr. J. M. A. Lenihan when he read a paper, "The Principles and Application of Radar," before the Scottish Engineering Students' Association at Glasgow recently.

The bat avoids collision with obstacles in the dark by sending out sound signals at a frequency above the limit of human audibility, and picks up the reflection from any opaque object in the vicinity, the direction and intensity of the echo telling him what avoiding action to take.

This, of course, has been proved experimentally when it was discovered, for example, that if a bat's ears were plugged it became unable to avoid obstacles in its path.



WINGED AIR TUNNEL is the nick-name given to this Republic XP-84 jet-propelled fighter which recently completed initial flight tests at Muroc Field, California. The single axial-flow G.E. unit with nose intake permits very clean lines, as these two views of the aircraft show to advantage

Surely Not First Again?

THE U.S. Navy has "recently disclosed" that the first, though unpremeditated, landing by a jet-powered aircraft on a carrier deck was made by a Ryan Fireball on November 6th last. The landing was being made using the Fireball's conventional radial engine, but this faded out during the approach and the pilot started up his jet unit to complete the operation successfully.

The first *normal* landing on a carrier by a *purely jet-powered* aircraft was made by a D.H. Vampire on December 3rd, as described in *Flight*, December 13th.

Gas-turbine Locos

PLANS for a gas-turbine locomotive, based on aircraft experience, are under consideration by the Great Western Railway, it was announced by Lord Portal, the G.W.R. chairman, at the company's annual meeting at Paddington last week.

Later, an official of the G.W.R. assured a Press representative that "gas-turbine locomotives are still in the experimental stage," and he went on to say that it would be at least 18 months before the turbine units would be available.

There is, of course, nothing new in the idea itself. An experimental gas-turbine locomotive has been running in Switzerland for several years, and plans are well ahead in America to produce another experimental prototype.

Helicopter School

THE first of its kind, the Coast Guard Helicopter School at Floyd Bennett Field, N.Y., is one of the few Service training schools in America which has shown no sign of curtailing operations since the end of the war.

This school was founded in April, 1944,

HERE AND THERE

but even then the stress was on peacetime operations because it was felt that many of their normal duties would best be carried out by the use of helicopters.

At first the school only had two helicopters, and the original instructors themselves still had much to learn. Today there are 23 machines—Sikorsky R-4s and R-6s—and British pilots and mechanics are among those being trained there; the school is not confined to members of the Coast Guard Service.

The present course requires 35 hr. flight instruction and solo practice.

N.A.I.A. Dinner

IN spite of the importance and the excellence of its work, one does not ordinarily hear very much about the Naval Aircraft Inspection Association, which may, of course, be due to its close association with the Silent Service.

But it broke the silence to the tune of nine speeches and a concert when the Association's Fleetlands branch at the Royal Naval Aircraft Repair Yard held its annual dinner at Gosport recently.

Mr. R. G. Harvey, the Association's vice-chairman, presided over the gathering, which was attended by some 150 members and guests, including Capt. W. T. A. Jordan, Superintendent of the Fleetlands repair yard, who said that he started the inspection system at Donibristle in 1940 with one sub-lieutenant and a flight-sergeant, who worked with "the jaundiced eye of the operators fixed on them." But the inspectorate had developed since then; now it was well equipped and efficient, and the jaundiced eye had given way to understanding and co-operation.

PRUDENCE is the R.A.F.'s safety-pin-up-girl created by Section Officer Ruth Walker, former fashion artist, as part of the campaign to reduce Service flying accidents. The posters are being widely displayed at R.A.F. stations.

News in Brief

ALL American Army cadets will in future receive basic training in aviation, including flying instruction, according to New York radio quoted last week by *Reuter*.

* * *

No. 66 (1st Croydon) Squadron A.T.C. is forming an Old Comrades' Association and ex-cadets who are interested should write to F/O. J. W. Ellis, 33, Outram Court, Outram Road, Croydon.

* * *

When the families of R.A.F. and other Service personnel are allowed to join their menfolk serving in Germany, the Soldiers', Sailors' and Airmen's Families' Association ("Ssafa") will have vacancies for more nurses.

* * *

The R.A.F. has asked the committee of the Churches Work for Women in the Forces to provide chaplains' assistants for work among the W.A.A.F. on similar lines to that which has been done among the A.T.S. at the request of the War Office since 1942.

* * *

Bernt Balchen, well known before the war as a polar pilot and at present a colonel in the U.S. Army, is expected to take up an important post with Norwegian National Airways, according to the Oslo newspaper, *Verdensgang*. Johan Christie, a Norwegian pilot who flew in raids from this country on German targets during the war, has also been named for an executive position.

* * *

Approval has been given for the appointment of a chief constable and a deputy chief constable of the Air Ministry Constabulary. Mr. F. J. May, O.B.E., has been appointed Chief Constable, and Squadron Leader D. F. Grierson, M.B.E., Deputy Chief Constable.

* * *

R.A.F. Transport Command exceeded its February air-trooping programme from India, carrying home 5,699 men from all three Services; its allocated target was 5,000. The Command flew nearly 50,000,000 passenger miles over the U.K.-Mauripur 4,840-mile route without incident.

* * *

Wing Cdr. H. T. Andrews, well known in aviation circles before the war, has recently been appointed sales manager to Cunliffe-Owen Aircraft, Ltd. He served in the R.A.F. from 1925 to 1930 and was afterwards chief test pilot to the Spartan Aircraft Co., and then assistant test pilot to the late Chris Staniland at Fairey's. He competed in King's Cup and other races and rejoined the R.A.F. on Sept. 1st, 1939.

* * *

Canada's post-war Air Force of 30,000 men will cost about £13,000,000 a year to maintain, according to a recent statement by Mr. Colin W. G. Gibson, the Dominion's Air Minister. Pre-war expenditure on the R.C.A.F. was only £1,550,000 a year.

* * *

Mr. R. Stokes, Labour M.P. for Ipswich, paid a tribute to the pilot and crew of the Dakota in which he was one of 18 passengers, when it was necessary to make a last-minute belly landing at Croydon owing to the bad conditions.

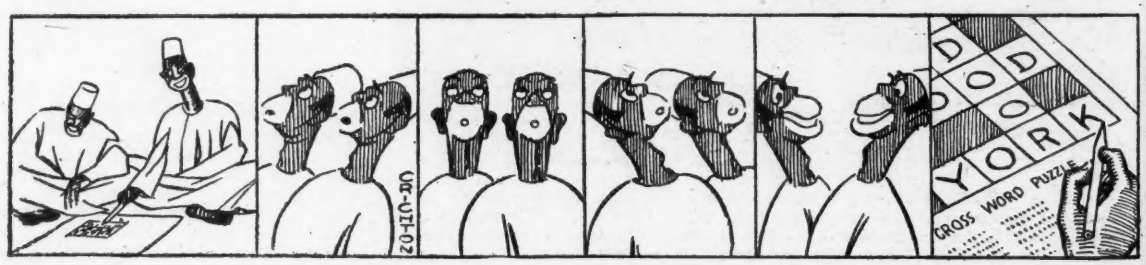
* * *

Mr. A. E. Rudder, who is B.O.A.C.'s Australian representative, and Vice-Chairman of Qantas Empire Airways, has become, also, Chairman of Tasman Empire Airways, Ltd., in succession to the late Brigadier Falla.

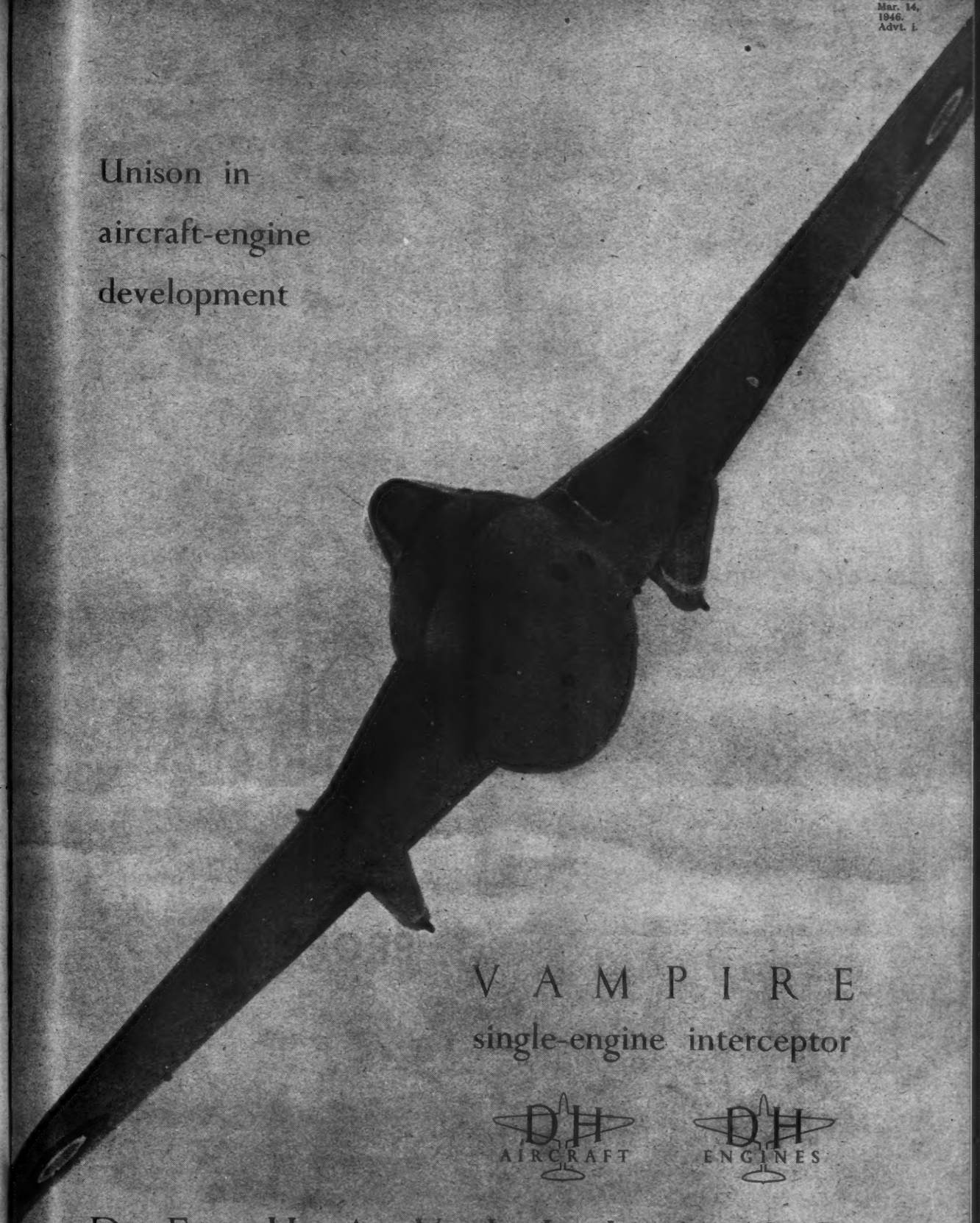
* * *

Commonwealth Aircraft Inc., of New York and Kansas City, have purchased the Columbia Aircraft Corp. Volume production of the new Commonwealth Trimmer three-seater amphibian with two 85 h.p. Continental "flat-four" air-cooled engines, is announced for May.

AIRSTRIP . . . No. 5



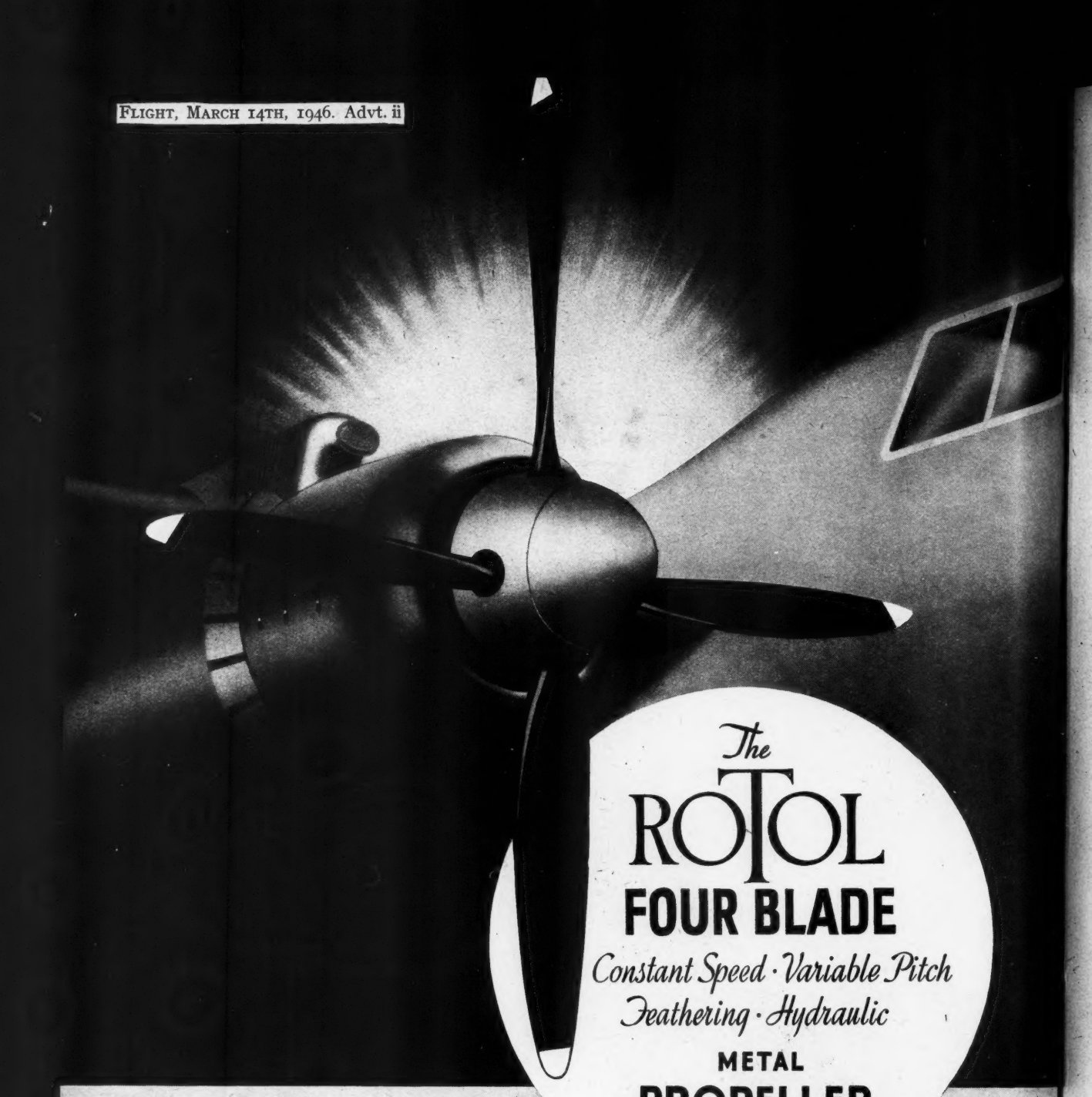
Unison in
aircraft-engine
development



VAMPIRE
single-engine interceptor

DH AIRCRAFT DH ENGINES

DE HAVILLAND



The

ROTOL

FOUR BLADE

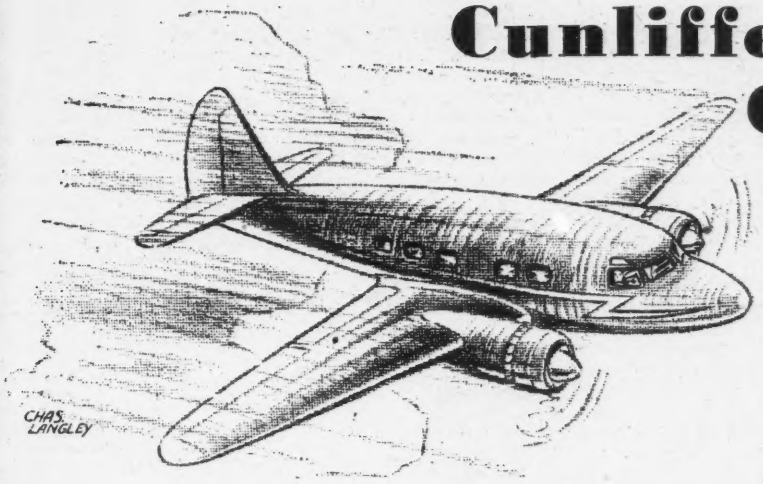
Constant Speed · Variable Pitch
Feathering · Hydraulic

METAL

PROPELLER

Fitted with Fluid de-icing Equipment to the

BRISTOL TWIN ENGINE MONOPLANE TYPE 170



Cunliffe-Owen Concordia

Useful 10-12 Seater Feeder-line Type Under Construction : Tricycle Undercarriage : Alvis Leonides Engines.

WHEN thinking subjectively of civil aviation, one almost automatically thinks in terms of large aircraft capable of transporting scores of passengers over thousands of miles. This is, of course, a very narrow view and, as with all such views, is unjust to the feeder-line operator.

Considering the number of passenger aircraft likely to be in commercial operation, say, in five years' time, it is inevitable that feeder-line types will preponderate. Logically so, for they will be used on the regional and local services which complement the trunk services and, as in other forms of transport, it is the local services which make up the greater part of a communication system.

Realising this and surveying the potential field, the Cunliffe-Owen Concordia would appear to be a most useful machine with a very healthy future before it.

As may be seen from the accompanying illustrations, the aircraft is a roomy, good-looking, twin-engined aircraft on sensible, straightforward lines. There is nothing very advanced or super-new about the Concordia; it is intended to be a simple, robust, utilitarian machine well up to its job. This is not to suggest that the design is lacking in any respect; on the contrary it can be said that, while no untried features are incorporated, all those modern refinements which have been thoroughly proven have been embodied.

The capacious fuselage offers a generous volume of 50 cu.ft./passenger for ten individual seats, five each side; and for the greater part of the cabin length, six feet of headroom is available. Windows are of relatively large area and conveniently pitched in relation to the seat stations, although it should be pointed out that, if an operator requires twelve seats rather than the normal ten, as may well be likely, then the window pitching is not so convenient.

At the rear of the cabin, to starboard and opposite the main entry door, is a separate compartment for the stowage of passengers' baggage, and, aft of this, for the full fuselage width, is a toilet room furnished with a chemical closet, lavatory basin and mirror. Light personal baggage can be carried in racks extending the length of the cabin above the seats.

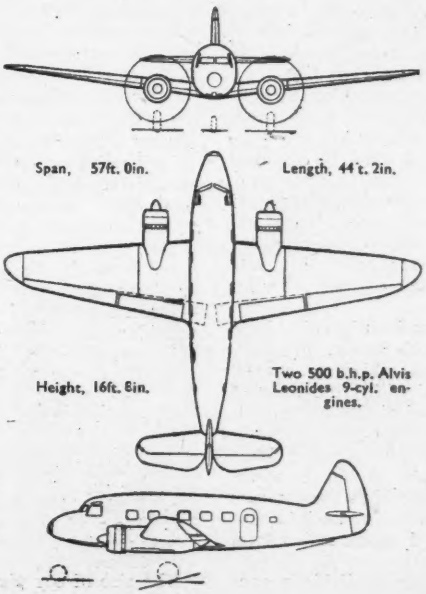
An additional feature which may be embodied is the provision of unit freight bins, each of about 12 cu. ft. capacity, which could be installed in place of seats if, say, only eight passengers but an extra load of freight were carried on a given journey. This is a transport condition which may often arise in comparatively undeveloped countries, and provision against such a contingency is an excellent feature.

The control cabin is separated from the passengers by a bulkhead in which is an access door, and, as this bulkhead is almost in line with the plane of the airscrews, it should have an advantageous effect on noise suppression. To this same end, the fuselage interior will be lagged with a cellular insulating material.

Control Layout

Control columns are offset, with cantilever arms carrying the "spectacles" for aileron control, the second pilot's column being easily removable and replaceable so that if only one pilot is required, the starboard seat position is unhindered by the redundant column. In this case the "first officer" would act as navigator-radio operator, the radio equipment being stowed partly on the bulkhead and partly in the nose compartment, and operated by remote control.

The layout provides the captain with the conventional blind-flying instruments, whilst the "clocks" for engines and ancillary services are arranged before the second pilot. Between these groups of instruments is fitted the control panel for the automatic pilot.



Instrument planning is a subject which is open to argument to a greater extent than, probably, any comparable element of an aircraft. The layout in the Concordia is not yet finished since the machine has yet to undergo flight trials, and in these circumstances a criticism one way or another on such a subject can scarcely be justified.

Field of view from the pilots' seats is really excellent, the screens being of reasonable depth and relatively close to the eyes. A further admirable feature is the provision of transparent panels above the side windows so that an "inward" view is possible during a steep turn. One cannot help but feel that, with most modern types, and almost irrespective of size, the pilots will be virtually "blind"

D

CUNLIFFE-OWEN CONCORDIA

when, for instance, orbiting a field in dirty weather—and it is in just such circumstances that the widest possible field of view is an urgent necessity.

The undercarriage geometry is not unorthodox, but it is worth noting that the main legs retract upward and forward into the nacelles, whilst the nosewheel leg retracts rearward and rotates through 90 deg. during the upward swing to be stowed with the plane of the wheel horizontal. Further, a transmission between rudder pedals and nosewheel to permit the latter to be steered may well be added. The operation of the undercarriage—as for other power services—is electric.

Control surfaces are all-metal, the 25-per-cent. chord ailerons being of the piano-hinge type, whilst rudder and elevators have the conventional aerodynamic balance nosings; in addition, these tail surfaces are also horn balanced, and all control surfaces are fitted with normal trim tabs. Flaps are slotted and, like the ailerons, are 25-per-cent. chord in width.

The Concordia is designed for two Alvis Leonides L.E.I.M. nine-cylinder radial engines of 500 b.h.p. each, which are fitted as complete power plants. The diameter over the rocker boxes is only 41.5in, which is just about as low a figure as it is possible to get in a radial engine of this output, and the units are very neatly cowled, so the drag case may be regarded as reasonably low. The power/sq. ft. frontal disc area corresponds to 52.6 b.h.p., and the power/weight ratio is as low as 1.44 lb/b.h.p. All accessories are mounted on the rear casing, where they are readily accessible, and each engine is flexibly supported in a mounting frame, itself anchored to the airframe at four points with M.A.P. No. III pin-joint attachments. Carburation is by Hobson Master Control injection equipment feeding into the eye of the centrifugal supercharger impeller. The injection metering is fully automatic, with single-lever control, while the throttles and throttle bodies are oil heated.

CUNLIFFE-OWEN CONCORDIA

Data and Estimated Performance

Wing area	435 sq. ft.
Aspect ratio	7.46
All-up weight	11,000 lb
Wing loading	25.3 lb/sq. ft.
Take-off power	1,000 b.h.p.
Power loading	11 lb/b.h.p.
Max. speed	223 m.p.h. at 3,255ft
Max. cruising speed	212 m.p.h. at 8,000ft
W.M. cruising at 60 per cent. max. power	190 m.p.h. at 7,000ft
Max. range	1,200 miles
S.L. stalling speed, flaps down	67 m.p.h.
Absolute ceiling	23,000ft
Service ceiling	21,000ft
Take-off ground run	316 yd
To clear 50ft screen from rest	574 yd
Max. S.L. climb—one engine	360ft/min

Turbine/Piston Aero Engine

Summary of an Interesting Paper Read Before the R.Ae.S.

By Dr. H. R. RICARDO, F.R.S., F.R.Ae.S.

DR. H. R. RICARDO yesterday presented his Paper "Turbine Compounding of the Piston Aero Engine" before the Royal Aeronautical Society, and convincingly put forward the case for combining a piston engine with a gas turbine. He said that the gas turbine is inherently very greedy of fuel, but that there are more complex forms of turbine at present in preparation which will be more economical in fuel, and that it is with these more complex forms rather than with the simple types of the present day that the compound engine will have to compete.

Clearly the efficiency of any heat engine is a function of the range of temperature it can usefully employ. The turbine is handicapped by the fact that the upper limit of the temperature range through which it can work is in the region of 700 deg C, while the flame temperature attained by the combustion of any hydro-carbon fuel in air lies between the limits of 2,200 and 2,500 deg C. To bridge this wide gap between the maximum temperature available and that which we dare use, four or five times the amount of air required for combustion must be supplied as a temperature dilutant. The conventional piston engine, on the other hand, can utilise the upper ranges of temperature but can make little use of temperatures much below about 1,500 deg C. Thus we have two forms of prime mover, the one eminently suitable for converting into power the heat available in the higher ranges, the other for conversion at the lower temperatures.

Additionally, the piston engine is eminently suitable to deal with relatively small volumes at high pressure and temperatures, and the turbine, by virtue of its high mechanical efficiency and large flow areas, to deal with large volumes at low pressures. Clearly then the logical development is to combine the two, in series, to form a compound unit. Instead of lowering the temperature by pumping large volumes of dilution air at a heavy cost in blower work, let us lower it rather by converting the high temperature heat into useful power; in other words, let us interpose between the blower and the turbine a dynamic rather than a static combustion chamber.

In the combined plant we shall have available a considerable excess of air over and above that required for complete combustion, due to the gap between the minimum temperature of the piston engine cycle and that which the turbine can digest. The gap is such that we shall have to provide nearly 2½ times the air required for complete combustion of the fuel, so we need not worry about thermal efficiency in terms of air consumed. Nor, so far as the piston engine is concerned, need we worry much about efficiency in terms of fuel, for what is lost in the cylinder by delayed or incomplete combustion will be recovered in the turbine. We must, therefore, revise entirely our ideas on piston engine design. Our objective is now to develop an engine which shall offer the freest possible passage of air through its cylinder, and which shall be capable of burning the maximum possible amount of fuel per unit of cylinder volume.

Two-stroke Piston Engine

In the first place, thanks to the excess air, we can employ a two-stroke engine, and, therefore, a much smaller cylinder since a two-stroke engine can pass far more air than its cylinder volume defines. Again, we need not worry about scavenging efficiency and can use the simplest possible expression of two-stroke with piston controlled ports. Further, in view of the fact that we cannot, in any case, burn all the air available, we can with advantage employ compression ignition in preference to spark ignition—for in the former, as in the turbine, we are compelled to provide some surplus air. The use of C.I. confers additional advantages:—

1. We need not worry about maintaining specific relationship between fuel and air, hence control can be on fuel supply alone.
2. We are completely exempt from the menace of detonation as the hotter the air, within limits imposed by lubrication, the better the combustion and the smoother the running.
3. Fuels will be the same as those of the straight turbine.
4. We shall be free of electrical ignition with all it implies in weight, radio interference, and potential sources of failure.

The size of our piston engine will be determined almost

solely by the amount of fuel we can burn under take-off conditions per litre of cylinder capacity per hour, and this in turn will depend largely upon the pressure at which we choose to operate our turbine.

It would seem that the best all-round compromise will be to work at a pressure of about six atmospheres abolute for the maximum power. Generally speaking, the higher the operating pressure the more will the burden of power production be thrown on the turbine, and the smaller the size and output of the piston engine.

With the component efficiencies which we realise today, and taking fully into account the losses due to direct heat flow to the cylinder walls and the pressure drop through the engine cylinders, the overall efficiency from the fuel to the airscrew shaft of such a compound plant should lie between 40 per cent and 45 per cent when cruising at 15,000ft at 50 per cent take-off power—this corresponding to a consumption of diesel oil of 0.3 to 0.34 lb/shaft h.p./hr., rising to about 0.4 lb under take-off conditions.

Dr. Ricardo said that these figures take no account of the additional jet thrust available, which would be there at all times as a bonus and, under some conditions, as a really substantial bonus.

He went on to say: We come now to this conclusion: the combined plant will consist of a blower, preferably of the axial flow type with, perhaps, a centrifugal for the last stage, a very small and simple piston engine in place of the usual combustion chamber, and a gas turbine. Of these three components the piston engine will deliver, and the blower will consume, about the same power, while the turbine will deliver about 50 per cent more than either.

FOUR important lectures were read before the R.Ae.S. on March 13th during a full-day discussion on the Gas Turbine. Dr. H. R. Ricardo's paper, here summarized, is of special interest in that the combination of piston engine and gas turbine in one compound unit, and the potential high fuel economy obtainable from such a unit, is authoritatively discussed for the first time. Other papers were "The Application of the Gas Turbine to Aircraft Propulsion" by Dr. S. G. Hooker, "The Application of the Gas Turbine in its Forms to the Field of Commercial, and to the Field of Military Aviation" by Mr. R. M. Clarkson and Mr. W. G. Carter respectively.

In reference to the more complex forms of turbine which are in sight, it goes without saying that anything the designer or metallurgist can do to raise the working temperature will be all to the good, for it will both extend the useful temperature range and reduce the present very high ratio of dilution to combustion air. In any case any improvement in this direction will also help the compound plant.

If we are going sufficiently to improve the efficiency of the straight gas turbine, we must adopt one or other of two courses; either we must work with a very high overall pressure ratio, something of the order of 16 or 20, or stick to our present low ratio and conserve fuel by using waste in place of live heat, i.e., by using a heat exchanger.

If we go in for a very high compression ratio then the high-pressure stages of the blower, the combustion chambers, ducting, and turbine casing will all be subjected to a pressure of nearly 300 lb/sq. in., and that at temperatures ranging from 300 deg C to 700 deg C or even higher.

The other general line of approach is to work with quite a low compression ratio and swap exhaust heat for live heat. Clearly there is scope for much ingenuity in the development of a heat-exchanger, yet it would appear evident that it must necessarily be very bulky. Consider the problem; we have to exchange heat from something like a ton of air per minute with an extreme temperature difference of only about 400 deg C and that, too, without any appreciable back pressure.

With regard to the compound unit it is generally argued that the addition of a piston engine will involve a very great, if not a prohibitive, increase in both weight and bulk; but to consider this aspect more closely, the actual capacity of the engine is determined by the amount of fuel which can be burned per hour per litre of cylinder capacity. Preliminary experiments with a simple valveless two-stroke cylinder, working with an inlet pressure, so far, of only 4.4 atmospheres absolute at 2,400 r.p.m. show already that we can burn between 50 and 60 lb of diesel oil per hour per litre with a maximum cylinder pressure not exceeding 1,400 lb/sq. in., and without running into any thermal troubles. When, as we intend, we go up to a pressure of six atmospheres and higher revolutions we shall be able to increase this figure to about 80 lb, but to be on the safe side let us assume that the weight of fuel burnt will be 64 lb/litre/hr under take-off conditions. If, now, the overall specific consumption under take-off conditions is 0.4 lb/b.h.p./hr then the net power output of the complete plant will be 160 h.p./litre of piston engine.

As to weight, the current weight of aero engines working at smaller maximum pressures, when stripped of their supercharger, ignition equipment, and such auxiliaries as will form part of the turbine plant in any case, is between 40 and 45 lb/litre. Valveless engines should be considerably lighter, but let us take the weight as 40 lb/litre. The weight then of the piston engine in the combined plant should work out at about 0.25 lb/shaft h.p. By no means all this weight is additional, for it must be remembered that the engine replaces the combustion chambers. Further, since the mass flow of air will be approximately halved, the blower, turbine, and all the ducting will be correspondingly lighter and smaller. Moreover, nowhere except inside the engine cylinder will the pressure exceed, say, six atmospheres absolute. As an illustration, an engine of the same cylinder capacity as the old Bristol Mercury should suffice for a net output of 4,000 shaft h.p.

SIR ARTHUR SIDGREAVES RETIRES

AFTER more than twenty-five years' service with Rolls-Royce, Ltd., Sir Arthur Sidgreaves, O.B.E., is retiring at his own request from his position as managing director, as from March 31st. He will at the same time retire from the Boards of Bentley Motors (1931), Ltd.; Rotol, Ltd.; Park Ward, Ltd.; and Allied Motors, Ltd. (India).

Sir Arthur Sidgreaves.

Sir Arthur joined Rolls-Royce, Ltd., as export manager in 1920, was appointed general sales manager in 1926, and managing director on February 1st, 1929. One of the outstanding figures in the aeronautical and car industries, he has had a life-long association with the development of the internal combustion engine.

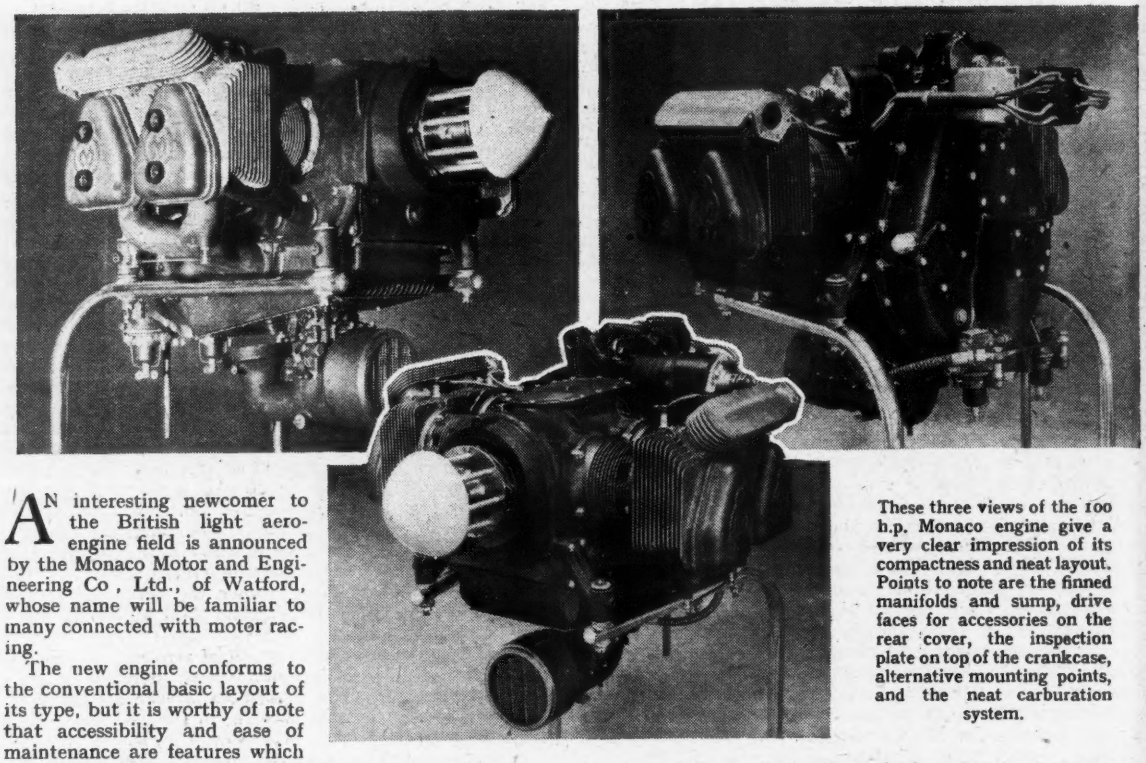
When the Government introduced their shadow factory scheme before the war, Sir Arthur undertook, on behalf of Rolls-Royce, to build an entirely new factory at Crewe, to augment production of the Merlin engine at Derby. The success of the factory at Crewe resulted in Rolls-Royce being requested to build still another one at Hillington, near Glasgow. Production started at this factory within six months.

Mr. E. W. Hives.

For Sir Arthur's services to the nation during the war period a knighthood was conferred upon him in the New Year's Honours in 1945, and during World War No. 1 he was awarded the O.B.E. for his services in the R.N.A.S. He was chairman of the Society of British Aircraft Constructors from 1941 to 1943. Mr. E. W. Hives, C.H., O.B.E., will succeed Sir Arthur as managing director. Since 1936, he has been general manager and works director. Another appointment to the board is that of Mr. W. T. Gill as commercial and financial director.

The Monaco Engine

New British Flat-Four Light-Aircraft Engine in 75 h.p. and 100 h.p. Sizes : Simplicity Allied to Advanced Design Features



These three views of the 100 h.p. Monaco engine give a very clear impression of its compactness and neat layout. Points to note are the finned manifolds and sump, drive faces for accessories on the rear cover, the inspection plate on top of the crankcase, alternative mounting points, and the neat carburation system.

AN interesting newcomer to the British light aero-engine field is announced by the Monaco Motor and Engineering Co , Ltd., of Watford, whose name will be familiar to many connected with motor racing.

The new engine conforms to the conventional basic layout of its type, but it is worthy of note that accessibility and ease of maintenance are features which obviously have been kept in mind in planning the design.

The makers state that they noted the type of engine used in light aircraft in America (Lycoming, Franklin and Continental) and the phenomenal growth of sales of these engines in the five years preceding the war. Since there was no comparable British engine, Monaco set themselves out to design one embodying the advantages of their experience in high-performance power units for racing cars, the engines for which, it may be noted, are subjected to much higher loadings than ever called for from normal aircraft engines.

The heavily-finned cast-finished cylinders are bolted to the unit crankcase, the bores for the 75 h.p. version being 4 in, and for the 100 h.p. version 4.375 in ; the stroke in each case is 3.625 in, and thus the swept volumes are respectively 182 cu. in. and 218 cu. in. (3 litres and 3.6 litres).

Extensive use of light alloys in conjunction with careful detail design ensures that the weight of the engine is kept as low as possible, and the extreme simplicity of its construction should enhance ease of production, the latter factor by itself having a powerful influence on the purchase price.

A full range of accessories is provided, and any combination may be assembled without alteration to the rear cover or accessory drives—a feature which is extremely rare on engines of this class. Further, close attention has been paid to cooling, and the cowling is therefore to be sold as an engine part ; considering this in conjunction with the accessories, it is justifiable to regard the unit as a complete power plant.

The makers argue that it is vital that this country comes to the fore immediately with a suitable answer to the American trio of flat-four light-aircraft engines, particularly in view of the undesirability of importing foreign types. On this count alone the new engine project is most deserving of success.

Monaco engines are intended for immediate installation in the Chrislea Ace, which is expected to commence its flight trials during the next few weeks.

The engines have not as yet been graced with a type name, and the manufacturers are open to receive any suggestions that readers care to put forward.

NEW HOME FOR G.A.P.A.N.

SINCE their original premises in the City were destroyed by enemy action, the Guild of Air Pilots have been sharing the Royal Aeronautical Society's building in Hamilton Place. They have now moved to new quarters in Londonderry House, Park Lane, W.1—appropriately enough, since the Marquess of Londonderry is Master of the Guild. The telephone number is Grosvenor 1212.

THE HERMES ACCIDENT

THE Ministry of Civil Aviation has now issued the conclusions which have been reached after the official investigation of the accident to the Hermes prototype which was lost on December 2nd, last year. These conclusions are:

1. It is considered that the accident was the direct result of elevator overbalance, this brought about flight conditions the nature of which caused the pilot to lose control.
2. Although the porpoising motions set up by the overbalanced elevators would have been expected, the final manœuvre of the aircraft, in climbing suddenly, cannot be satisfactorily explained.
3. It seems certain, however, that at different trimmer settings, a reversal of stick forces would have occurred with which the pilot could not have kept in phase as the loads increased.

THE LODGE LONG-TOM PLUG

designed expressly for and fitted exclusively to the wonderful "Bristol" Hercules sleeve valve engine

—★—

THE "Bristol" FREIGHTER

Powered by Bristol Hercules engines

Lodge Plugs Ltd., Rugby

Hurricane

• *The name that Battle of Britain Pilots will never forget . . .*

• *the name of the foremost fighter of the Second World War . . .*

• *the name of the latest "Harborough" publication . . .*

The book is illustrated with over 80 photographs, and has 136 pages. Bound in blue cloth with gilt lettering, size 8½ × 5½ ins. Dust cover as illustrated, in two colours.

PRICE
7/6
or 8/- by post.

★ ***HURRICANE*** *by F. H. M. LLOYD*

Now told for the first time the fascinating life history of one of the world's most famous aircraft –the Hawker Hurricane fighter of Battle of Britain fame. Not only does the book trace the technical and operational evolution of the Hurricane, but tells also of the men who designed and built them, the men who flight-tested them, and the R.A.F., Canadian, Czech, Polish, Russian and other fighter pilots who took them into action. It can indeed be said truly that "the story of the Hurricane is the story of the War itself." Among the odd facts revealed is that Jugo-Slavia had both Hurricanes and Messerschmitt 109s in her air-force, and spare parts for the maintenance of the Hurricanes had been bought from Germany after June, 1940—presumably salvaged from crashed R.A.F. machines! Get this book—you'll enjoy it.

●

A 'Harborough' Publication

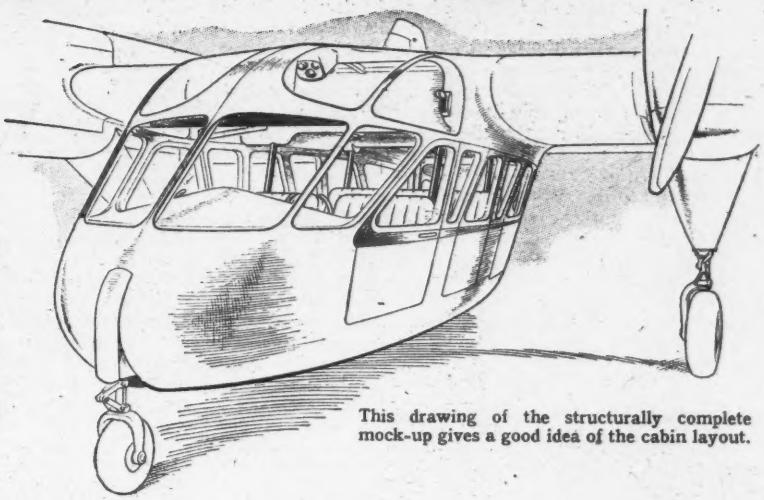
Order from your local Bookseller or send direct to—

The HARBOROUGH PUBLISHING CO LTD

Dept. ALLEN HOUSE • NEWARKE STREET • LEICESTER

An Ingenious Light Twin

Points from the Portsmouth Aviation Aerocar Series: Comfort and Full Equipment: Ambitious Design: Cirrus or Gipsy Engines



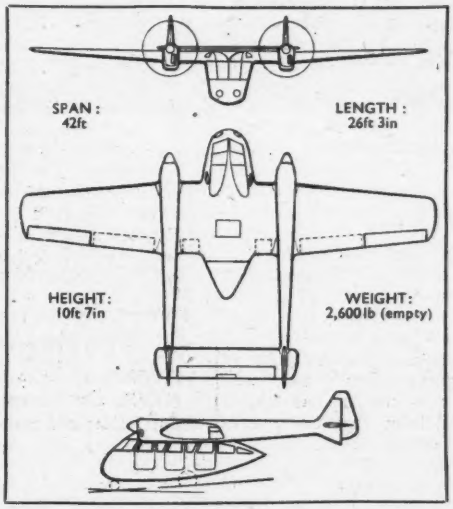
This drawing of the structurally complete mock-up gives a good idea of the cabin layout.

FOR one reason or another, nearly every small and medium-sized aircraft of pre-war days was developed along familiar lines, each series or type being the more or less natural successor to a previous one. So various formal shapes and arrangements tended to become standardized and accepted as normal—and not very many of these basic layouts were as convenient and practical as they might have been from the pilots' and passengers' points of view.

In planning the design of the Aerocar, Portsmouth Aviation have, so to speak, started from scratch and based their conception of what is wanted primarily on the obvious needs of pilot and passenger. Whether or not the eventual result will be as aerodynamically practicable as, in project, it appears to be, remains to be seen. There is no obvious reason why it should not be so, and the only difficulties which one can foresee are the possibility, with so many comparatively new features, of a somewhat lengthy development period, and the chance that the prototype may turn out to be somewhat heavier than the original estimate. One has rarely known a prototype which has not mysteriously become heavier than was expected, and the odds and ends of ancillaries usually reach an unexpectedly high total.

The Aerocar, nevertheless, is a very interesting attempt to produce something quite new, and with a very much higher standard of comfort and convenience than has previously been considered to be possible. The design as a whole is primarily based on the assumption that the occupants are the most important people to be considered, and every effort has been made to give "automobilic" ease of entry, roominess and travelling conditions, with, in addition, an unusually good field of view both downward and forward. Surprisingly enough, attention to these considerations has produced a layout which is, at the same time, aerodynamically attractive.

The high-wing arrangement, the underslung nacelle-type fuselage and, as an almost inevitable corollary, the boomed tail, give the aircraft a distinctive appearance. With this arrangement the cabin structure, since it is not carrying any fore-and-aft or heavy landing-gear loads, may be relatively lightly stressed and can be given adequate door and window apertures as well as, in this particular case, a hinged opening at the rear for loading luggage and any inconveniently shaped items. The structure of the nacelle, is, in fact, a moulded plywood sandwich which is metal-covered below floor level.



Centre Section Structure

A primary structure of steel tubing carries the nacelle from the two box-type spars; this, with a triangular "keel," forms a rigid cradle. The keel also helps to take any undercarriage-up landing stresses and carries the normal nose-wheel loads. The centre-section, with the engine mountings, is, apart from the spars, also built up of steel tubing, while the outer wing sections are of conventional two-spar, ply-covered design. Two 30-gallon tanks are inboard of the engines, and two extra 15-gallon tanks can be fitted in the outer wings. Extending from the rear of the power plant mountings are the two booms carrying the tail surfaces. These are of semi-monocoque construction, each with four master stringers, or longerons, a number of subsidiary stringers, laminated bulkhead rings and ply covering. An experimental boom has already been load-tested. It is possible that a metal monocoque may be used in production aircraft if it is found that this can be made more lightly and cheaply than the present wood structure. The tailplane and twin fins and rudders are conventional ply-covered units, though fabric is used to cover the aft parts of the fins and the controls surfaces. Split-type flaps, in inboard and outboard sections, will be of metal.

Both flaps and undercarriage are to be pneumatically operated from an air reservoir fed by a Heywood compressor and with an air bottle in reserve for emergency undercarriage lowering. From the same system power is available for the brakes and for the new Sperry two-axis automatic pilot when this is fitted. The basic undercarriage geometry has been worked out in the general design, but the details are being handled by Dunlops. In mock-up form, at least, both the

AN INGENIOUS LIGHT TWIN

main undercarriage and nose-wheel mechanism is simple and ingenious. The nose wheel, incidentally, projects slightly when retracted so as to form a "rolling" surface ahead of the keel in undercarriage-up conditions. When down, this wheel is steerable through the aileron control wheel, with an automatic disengagement of the system when the weight is off the undercarriage, or when the engines have been stopped. It may also be disengaged at the wish of the pilot.

There are two interesting features in the engine installation. One is that the engines are arranged as "power plants" for quick removal, and the other that a new type of miniature Rotol variable-pitch and feathering airscrew is standardised on Major and Minor versions. An electric motor, controlled by the usual multi-position tumbler switch, operates the simple pitch-changing mechanism through a flexible drive.

As it appears in the mock-up, the control and instrument layout is on "transport" lines. All the major engine and trimming controls are carried on a centrally disposed bank, and there is a standard blind-flying panel in the centre of the dashboard, with undercarriage and flap indicators on the left and air pressure and fuel gauges on the right. Centrally disposed below the B.F. panel is a Decca navigator panel, with r.p.m. indicators and oil pressure and temperature gauges on either side. The Decca receiver, which is a "standard extra" will probably be mounted in the roof at the rear of the nacelle. An eye-level P-7 mirror-read compass will be standardised. There are manual trimming tabs both for elevator and rudders. The normal passenger arrangement for the Major and Junior models will be for six persons including the pilot, with two individual front seats, a single cabin-width seat with arm rests immediately behind and an additional individual seat at the rear, where there is also ample space for luggage. For any special purposes and luggage loading the rear part of the nacelle can be opened.

Of the three types available, the Major and Minor, fitted respectively with Gipsy Major 31 and Cirrus Minor II, are fully equipped and have a retractable undercarriage. The Junior, which is also fitted with a Minor II, has a fixed undercarriage and is more simply equipped for club flying and daylight use by private owners.

PORTSMOUTH AVIATION AEROCAR MAJOR DIMENSIONS AND ESTIMATED LOADINGS:

Span	42ft
Length	26ft 3in
Max. height	10ft 7in
Max. All-up weight	3,950 lb
Weight empty	2,600 lb
Disposable load	1,350 lb
Power loading	12.5 lb/b.h.p.
Wing loading	15.49 lb/sq. ft.
Aspect ratio	6.92

ESTIMATED PERFORMANCE:

Maximum speed (S.L.)	167 m.p.h.
Maximum cruising speed (S.L.)	153 m.p.h.
Cruising speed (65 per cent. power, (S.L.)	141 m.p.h.
Initial rate of climb	1,180 ft/min
Service ceiling	19,800ft
Landing speed (flaps down)	52 m.p.h.
Range (65 per cent power ; normal tankage)	670 miles
Maximum range (65 per cent power ; extra tankage)	1,000 miles

Dr. F. W. LANCHESTER

Death of a British Pioneer in Aerodynamic Aerofoil Theory

WITH the death, on March 8th, at the age of 77, of Dr. F. W. Lanchester, Great Britain has lost a true pioneer, whose name should be forever inscribed on the scrolls among the greatest. Yet to the modern generation Lanchester was almost unknown. That rather sad reflection is primarily due to the fact that Lanchester visualized aerodynamic theory at a time when the mechanism of lift and drag was unknown territory, and when man had not yet found means to produce a prime mover light enough to maintain a heavier-than-air machine in sustained flight.

F. W. Lanchester, LL.D., F.R.S

It was in 1897 that Lanchester first submitted to the Physical Society a paper on the subject of aerofoil theory, but it was much before its time and its significance was not appreciated. In 1907-08 he published his work on Aerial Flight in two volumes: "Aerodynamics" and "Aerodonetics." Still the theories propounded did not attract the attention they deserved, although they did result in Lanchester becoming a member of the Advisory Committee for Aeronautics, the body from which was to grow our present Aeronautical Research Committee.

While we at home neglected the work of F. W. Lanchester, others did not fail to realise its worth. In Germany, for example, Dr. Prandtl of Göttingen was working along similar lines and was aware of Lanchester's work, to which he gave full credit. For a great many years the circulation theory was known in this country as the Prandtl theory, and it was not until later that the two names were coupled in referring to the basic theory on which modern aerodynamic science is founded.

Frederick William Lanchester had a brilliant brain, and his interests ranged over an amazingly wide field, largely but by no means exclusively theoretical. In 1916 he published a book entitled "Aircraft in Warfare," which had actually appeared in the form of a series of articles in *Engineering* in 1914, before the outbreak of the 1914-18 war, so that it was based on pure reasoning unaided by actual practical experience. In that book he foretold a great many of the developments which have since come to pass, including the airborne torpedo and the aircraft carrier.

It is a blot on British aviation history that the last few years of Lanchester's life were embittered by neglect. It is no excuse to say that he had largely himself to blame, and that he was "difficult." Intolerant he undoubtedly was, but it is scarcely to be wondered at that a brain such as his should become impatient with men of lesser breed.

We on *Flight* consider ourselves fortunate to have had the honour to publish what must have been among the very last writings of Dr. Lanchester, a series of articles under the title "Exhaust Efflux Propulsion," published late in 1939 and early in 1940. As recently as last New Year, we received from him a copy of his very ingenious perpetual calendar, contained on the back of a standard-size postcard.

And now Lanchester has passed from our ken but not from our thoughts. It is to be hoped that the nation which neglected him during much of his lifetime will at any rate perpetuate his work by a memorial worthy of the "Grand Old Man" of aerodynamics.

TURBINE-JET PROPULSION

COPIES of the four-page colqured supplement (published FLIGHT, 21st February), explaining the principles of the Gas Turbine and comparing them with those of the piston engine, are still available, price 6d. post free, from FLIGHT Offices.

British Fighters To-day

Graceful Passing of the Airscrew Era: "Jets" Make their Debut

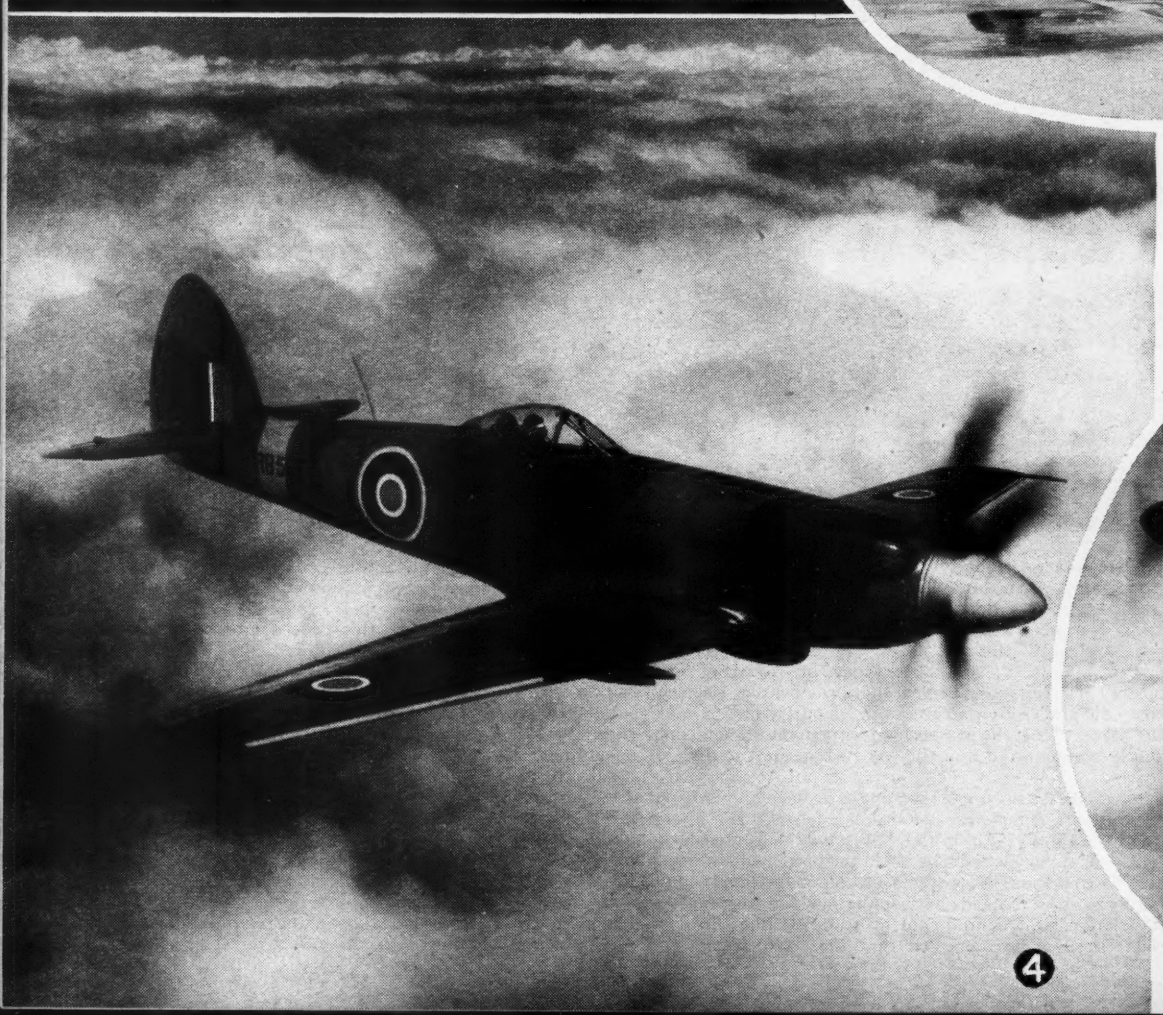
The Goblin-powered D.H. Vampire (above, is pre-eminent among modern jet fighters. It will be interesting to observe at what stage the turbine-jet will supersede the four-stroke engine for night intruders, typified by the Mosquito (left)

THERE was an inglorious period, as sail gave way to steam, when lanky funnels and paddle boxes ruined a vessel's lines and soot besmirched her sails. Interesting as it was with its transitional monstrosities to the naval architect, this era is one of deep, if secret, regret. Fortunately it shows no signs of recurring in aeronautics. The airscrew-driven fighter, at least, seems destined to die gracefully and to retain its purity of descent until the last. True, it has seemed expedient in one or two American designs to mix the gas turbine unit and the reciprocating engine, but these instances are exceptional and do not represent an important phase of development.

On these pages some blue-bloods of a passing period—the Mosquito, Firefly, Firebrand, Hornet and Tempest—are portrayed alongside two of their jet-propelled successors—the Vampire and Meteor. To avoid any impression of a family group flanked by aspidistras and displayed in juxtaposition to a candid-camera study at the "Four Hundred" it must be remarked that the "old brigade" comprises some of the most advanced airscrew-driven machines yet constructed, intended for long-continued employment in their own spheres.

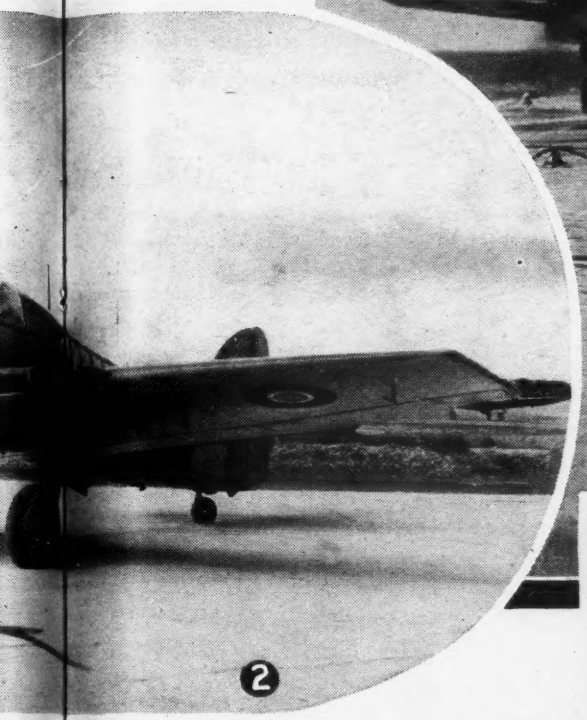
The two photographs on this page demonstrate particularly well how conflicting requirements are met, in one case by a pair of Merlins, and in the other by a single Goblin turbine-jet. The Mosquito shown in semi-silhouette is an intruder—a class of aircraft in which endurance, a speed superior to that of standard types of enemy bombers, and a heavy mixed armament of guns and bombs are shown to be compatible with good night-flying qualities, visibility and tractability at low levels. It may fall to an intruder to "bounce" an enemy fighter or bomber, to strafe a train, to pepper a dispersal area or to bomb a runway. A counterpart of the intruder, which operates by day or night, is the Mosquito fighter/bomber. "Mossies" of this breed scourged the distracted Wehrmacht in the Falaise Gap and on the Somme. On many nights of the war they were the only aircraft operating.

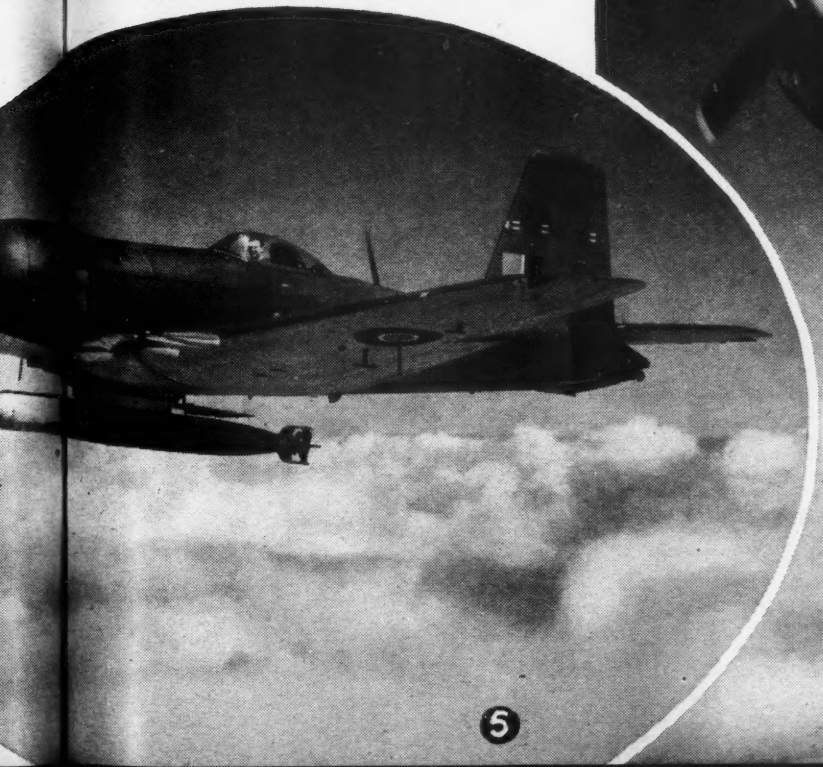
Six Moderns : Three for the Arm and Three for the



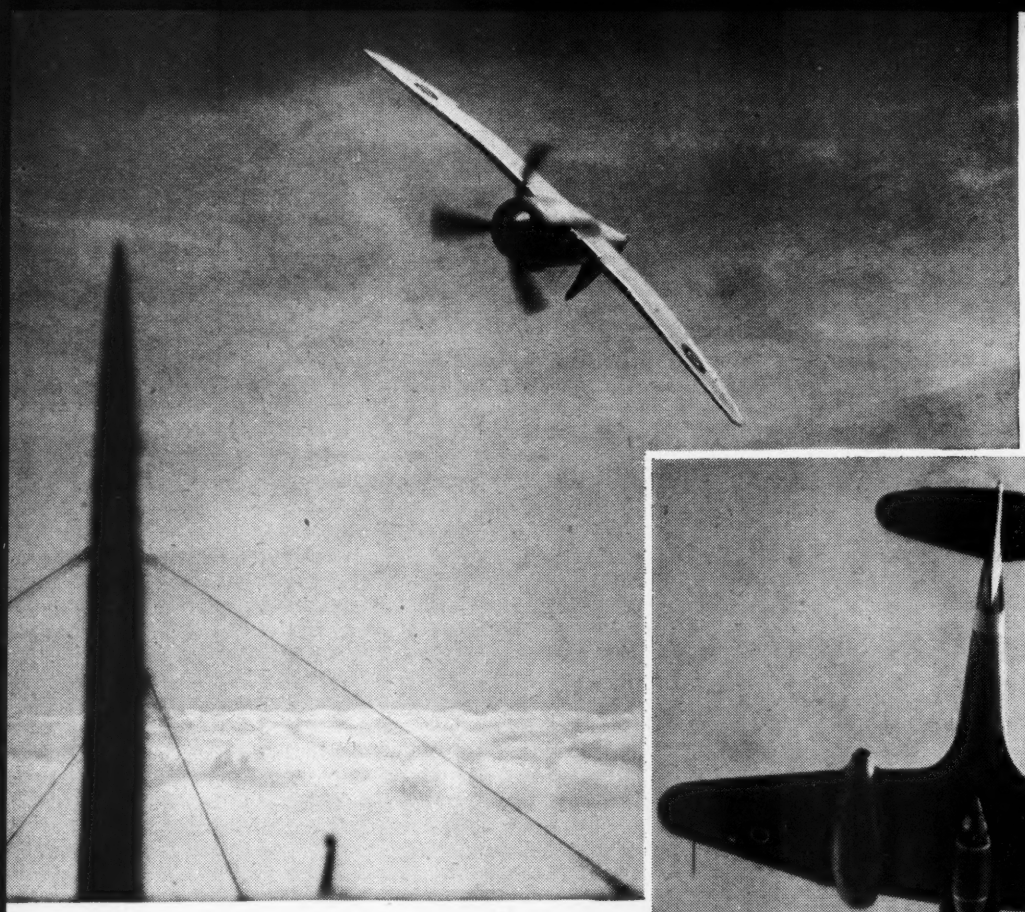
There is little to choose between the appearance of a Naval two-seater (2). Both (1 and 4) are believed to be 460 m.p.h. (5) and D.H. Sea Hornet (6) are Hawker Tempest V (6)

ree for the Naval Air
ee for the R.A.F.

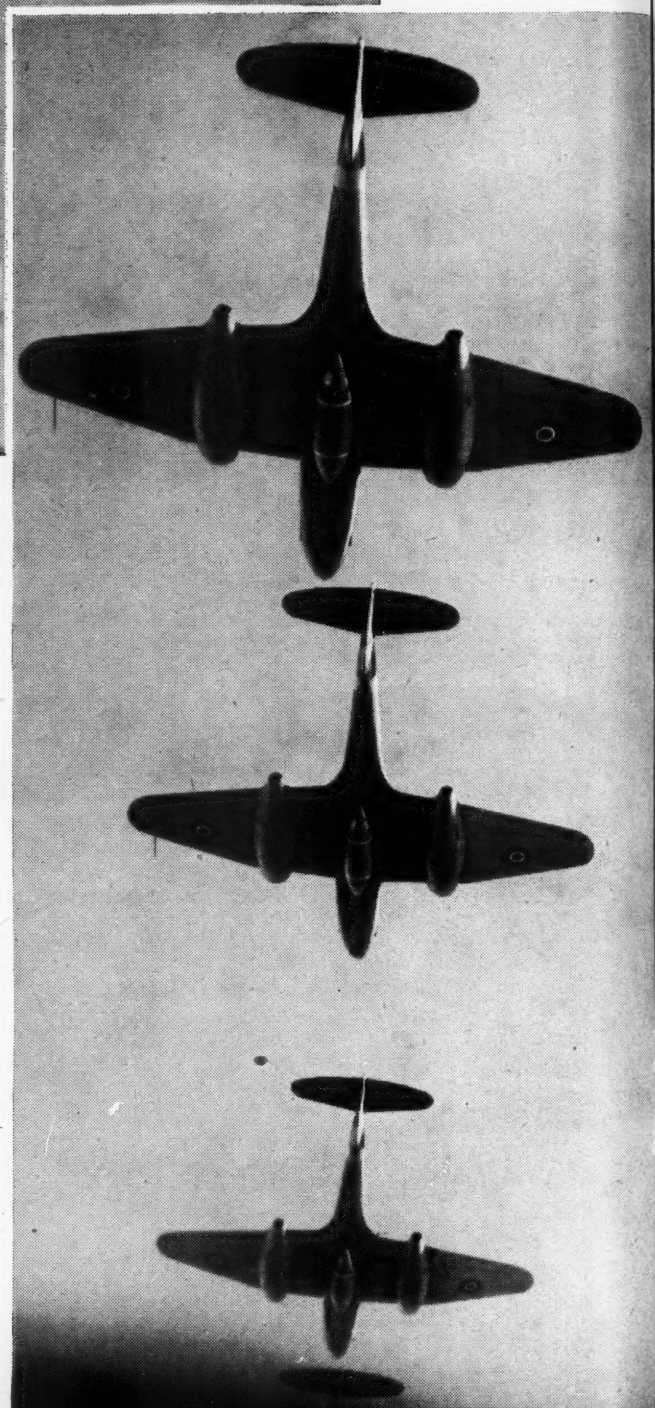




e is liking for the full designation "Fairey Firefly IV Fleet Fighter," val two-seater (2). The Hawker Fury and Vickers-Supermarine Spiteful d 4) are both 460 m.p.h. four-cannon single-seaters ; the Blackburn Firebrand nd D.H. Sea Hornet (3) strike a new note in Naval aircraft design ; while the awker Tempest V (6) is a fighter or fighter-bomber of great distinction.



Although built to meet substantially similar requirements, the Hawker Tempest II and Gloster Meteor will doubtless provide the means of evolving new tactics to suit the peculiarities of the tractor - airscrew and twin-jet fighters.

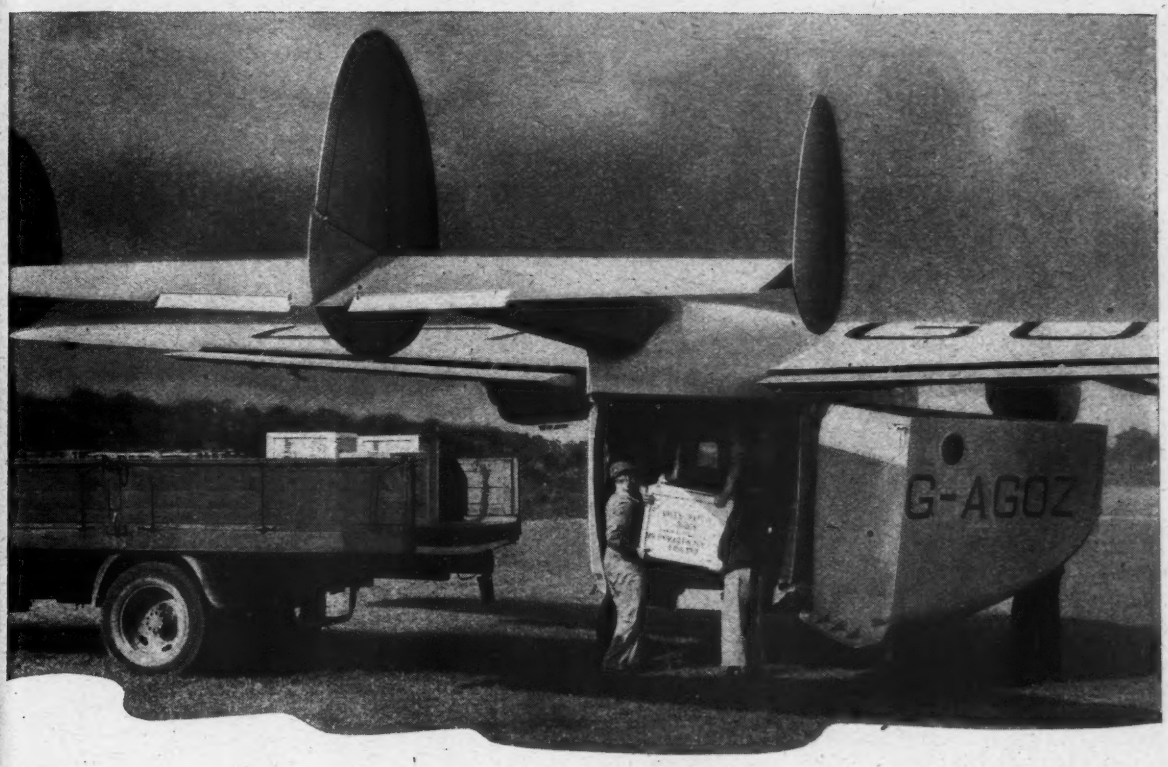


From a low-level night attack in thick weather—the target a crawling train—to a 4,000 feet-per-minute interception climb to 35,000 feet is a far cry. This is the Vampire's mission—interception and general combat duties over medium ranges at high speed. With its exceptional combination of speed and manoeuvrability and its comparatively long range it is a fighter which would have seemed distantly futuristic even at the beginning of the war. To-day it is becoming standard equipment in R.A.F. fighter squadrons and may soon be operating from carriers.

Speed in Service

The Gloster Meteor, with its twin Rolls-Royce Derwent turbine-jets, warrants prominent display if only because of its triumph in securing the world's speed record at 606 m.p.h. It is depicted, however, with its full panoply of war (including drop-tank) operating as a general-purpose fighter and formating easily in line-astern.

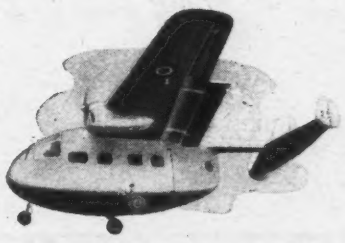
The remainder of the gallery is devoted to types with one characteristic in common—i.e. they are all single-engine tractor designs—but with widely different military applications. On pages B and C the Hawker Fury (Centaurus), and the Vickers-Supermarine Spiteful XIV (Griffon), two of the fastest airscrew-driven aircraft in the world, with speeds of at least 460 m.p.h., are shown in company with two specialized deck-landing designs—the two-seat Fairey Firefly IV and Blackburn Firebrand IV—each carrying full naval equipment and fittings permitting adaptation for a diversity of duties. The Firebrand represents a new concept so far as the Fleet Air Arm is concerned—namely a multi-purpose single-seat fighter or "strike aircraft" capable of operating as a dive bomber or torpedo-carrier. Experience with the Firebrand in its various roles may influence the development of twin-engined deck-landing types like the de Havilland Sea Hornet (top right), a long-range fighter of exceptional quality. Although the jet-propelled Vampire has already operated from a carrier, the "flat top" may prove to be the last stronghold of the propeller-driven fighter. The Sea Fury X gives little or nothing in performance to the land-based version already mentioned. Its relationship to the Tempest II and to the Tempest V (Sabre) is apparent.



1·7 cubic feet of cargo capacity for every horse power . . .

The Miles Aerovan sets new standards of economy in freight carriage by air. With 310 B.H.P., and a cargo capacity of 530 cubic feet the astonishingly high ratio of 1·7 cubic feet per horse power is achieved. Or, from another aspect, the freight capacity of 2,000 lb. gives a figure of 6·4 lb. of payload per B.H.P. This outstandingly versatile aircraft is readily adaptable as freighter, passenger plane, air ambulance, emergency operating theatre, flying caravan, mobile workshop, aerial shop or showroom. Add to the details already given such figures as cruising speed 112 m.p.h. . . . range 400 miles . . . take off 200 yards . . . stalling speed 46 m.p.h. price £5,000 . . . delivery 6 months . . . and you have complete support for the claim " the most efficient and economical aeroplane for short haulage freight and passenger operations."

MILES *Aerovan*



MILES AIRCRAFT LTD. · READING · ENGLAND

B.I. Callender's CABLES-

...a reliability feature on the airframe and engines of the . . . "Bristol" Freighter.

We manufacture all types of cable required for aircraft installations, high tension, low tension and radio frequency.

Full details on request.

BRITISH INSULATED CALLENDER'S CABLES LIMITED

NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

CIVIL AVIATION

A B.O.A.C. Boeing at Lagos. Native canoes were used for refuelling purposes in the early days of the route.

Transatlantic Trio

B.O.A.C.'s Boeing Service to Bermuda Withdrawn : Regular Schedule Maintained Since 1941 with Three Flying Boats

THE recent decision of B.O.A.C. to withdraw from trans-Atlantic service the three Boeing 314 flying boats closes an interesting phase of the Corporation's wartime effort. The three boats, *Bristol, Berwick* and *Bangor,* as they were named, flew well over one million miles each before being finally taken off the route. When they were withdrawn, *Bristol* had completed 203 trans-Atlantic crossings, *Berwick,* 201, and *Bangor* 192. The fact that such a regular service was maintained, and that 596 ocean crossings were made with only three boats, is a great tribute to B.O.A.C.'s operational organization.

The history of these flying boats dates back to the darker days of the war. After the fall of France, when things were going badly in the Mediterranean area, the country was faced with the unpleasant chance that the Mediterranean route might at any moment be closed entirely. Further, there was the additional risk that Lisbon might fall into enemy hands. In such an event the only communication with Egypt, India and the Far East would have been by way of a roundabout route non-stop to West Africa and across that continent to Khartoum; there was, consequently, an urgent need for aircraft capable of flying direct from the U.K. to Takoradi.

It was this crisis which led to the purchase, in 1941, of the three Boeings and they were intended to undertake, if necessary, non-stop flights to Takoradi from Poole. They were not, however, the subject of an arrangement under Lend-lease. On the contrary, they were purchased, new, from Pan-American Airways, at a cost of £259,250 each. The boats were delivered, one at a time, in May, June and July, 1941, and were put into service forthwith, making, as a beginning, a few odd trips to such places as Lagos and Freetown on the West African coast.

To ensure that they were able to fulfil the purpose for which they were bought, they were fitted before they left the U.S. with enlarged fuel tanks which provided a maximum cruising range of 4,500 miles. In addition, a special galley and pantry was installed in each aircraft to give additional accommodation for the crew.

In August, 1941, the regular trans-Atlantic service began, and this has been maintained with complete regularity from that time, until the last Boeing left Poole for America on March 7th of this year. The need for the Boeings to be used for non-stop flights to West Africa, happily, never materialised, and with the continued availability to Britain of Lisbon as a stopping place, B.O.A.C. was able to inaugurate a service to Africa with its other aircraft.

The trans-Atlantic Boeing service has operated to two different frequencies and routes for summer and winter periods. During the winter months the frequency was one service per week each way, the outward journey being from Poole, via Lisbon, Bathurst, Belem (Brazil), Trinidad, and Bermuda to Baltimore, taking an overall time of some 73½ hours. The return route was via Bermuda, and Foynes (Eire) to Poole, which took 28 hours, but at times the returning aircraft had to be diverted through Lisbon on account of bad weather. The summer schedule was four services per week each way, but a shorter route was used via Foynes and Botwood (Newfoundland), giving an overall time of 47 hours and a flying time of 28 hours.

Unescorted Flights

This was no mean schedule to maintain with the frugal resources of only three boats, but British crews flying these aircraft conveyed Government-sponsored passengers to and from America throughout most of the war, flying without escort, and relying simply on the protection afforded by normal Coastal and Fighter Command routine patrols. The time of take-off from U.K. during those dangerous years was always in the early hours of darkness, so as to allow the aircraft to fly through the night to Lisbon. Many famous people were carried. For example, the *Berwick,* in January, 1942, brought back Mr. Churchill, Lord Portal, who was then Chief of Air Staff, Admiral Sir Dudley Pound, the First Sea Lord, and Lord Beaverbrook from their visit to Washington.

Servicing was, at first, a major problem, for the route down to Lagos was virtually unsurveyed, and in the early days handling facilities along the West African coast were of the most primitive kind, the aircraft having to be re-

TRANSATLANTIC TRIO

fuelled from cans brought alongside in native canoes. All major maintenance of the three aircraft was carried out at Baltimore, and the flying schedules had to be arranged so that this was made possible. Minor overhauls were carried out at Hythe.

One interesting feature of the service was that it was run on a non-austerity basis. A first-class restaurant service was maintained on these three boats throughout the war, and such things as luncheon boxes and sandwiches were definitely *démodé*. Each Boeing carried a crew of eleven; a master, chief officer, two navigators, two flight-engineers, two radio engineers, two stewards and a purser. The alternative loads for the transatlantic trip were either 20 passengers sleeping and 9,100 lb of cargo, or 55 passengers seated and 6,800 lb of cargo. The cruising speed was 150 knots and each aircraft, fully laden, weighed well over 40 tons.

There is a story that, in the hands of their British crews, these boats used to make the direct crossing in a time half an hour less than that taken by their American-operated counterparts and using something like 150 gallons less fuel. Whatever the truth of this story, the performance obtained from these three flying boats by B.O.A.C., during the course of more than 4½ years, amply demonstrates that, in the words of Winston Churchill, "if we are given the tools, we can finish the job."

Planning for North Atlantic Safety

First of a Series of Conferences : Standardisation of Navigational Aids and Practices

THIRTEEN countries which are interested in the operation of air routes across the North Atlantic are represented at the North Atlantic Route Service Conference which is now in progress in Dublin under the auspices of the Provisional International Civil Aviation Organization. The countries represented are Belgium, Canada, Denmark, Eire, France, Iceland, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom, and the United States. Five other member-States of P.I.C.A.O., namely Australia, China, Czechoslovakia, Egypt and Luxembourg, have sent observers as this is the first of ten regional conferences to determine route operational procedure in various areas.

P.I.C.A.O., as its President, Dr. Edward Warner, explained to a plenary session of the conference, is seeking the greatest possible degree of uniformity of practice in all matters relating to air navigation. He said that, ideally, if a pilot were suddenly moved from his own familiar territory to a new environment 10,000 miles away he should find no unfamiliar air navigational practices.

The existing safety organisation in the area is T.A.S.S.O., the Transatlantic Air Service Safety Organization, an organisation sponsored jointly by Canada, Ireland, the U.K. and the U.S. before the war. The conference, which will establish a regional secretariat for the area, is considering what T.A.S.S.O. has achieved and how its work can be incorporated in the new organisation.

The main work of the conference, apart from establishing a regional organisation, is the production of a "route service manual." This is being carried out by sub-committees dealing with air traffic control, meteorological work, communications, airfields and ground aids, and search and rescue organisation. One of the problems is to decide how much of the wartime organisation which was created by the United Kingdom and the United States can be included in the new organisation. Much of the equipment is comparatively new and delegates have already debated whether any navigational aids still on the secret list will be released for incorporation in the system. It is generally believed that this will be done, although it has not yet been mentioned in open session. Dr. Warner has urged the delegates to expedite their work in view of the fact that transatlantic air traffic is now approaching twenty times the magnitude of that reached at the outbreak of war. Early in the proceedings it was revealed that the details requested from the delegations attending the conference regarding existing navigational facilities in their respective countries had not all been supplied.

So far during the proceedings there has been a marked reluctance to divulge information. For example, Canada's principal delegate, Mr. A. C. McKim, suggested that the conference needed full information on present and proposed schedules and the anticipated traffic volume before getting down to its work. The United States (Mr. Gerald P. Brophy) and United Kingdom (Air Commodore J. G. Murray) objected, and it was agreed that this information should be delayed until a later stage. Similarly the reviewing of existing facilities was postponed until reports have been submitted from sub-committees regarding actual requirements.

The operation of radio stations for air routes is one of the difficult problems. While the European countries favour the continued use of State-provided systems as the channel for all messages, the U.S. operating companies would prefer the American system whereby each company operates its own communications. Here, the indications are that the European view will prevail.

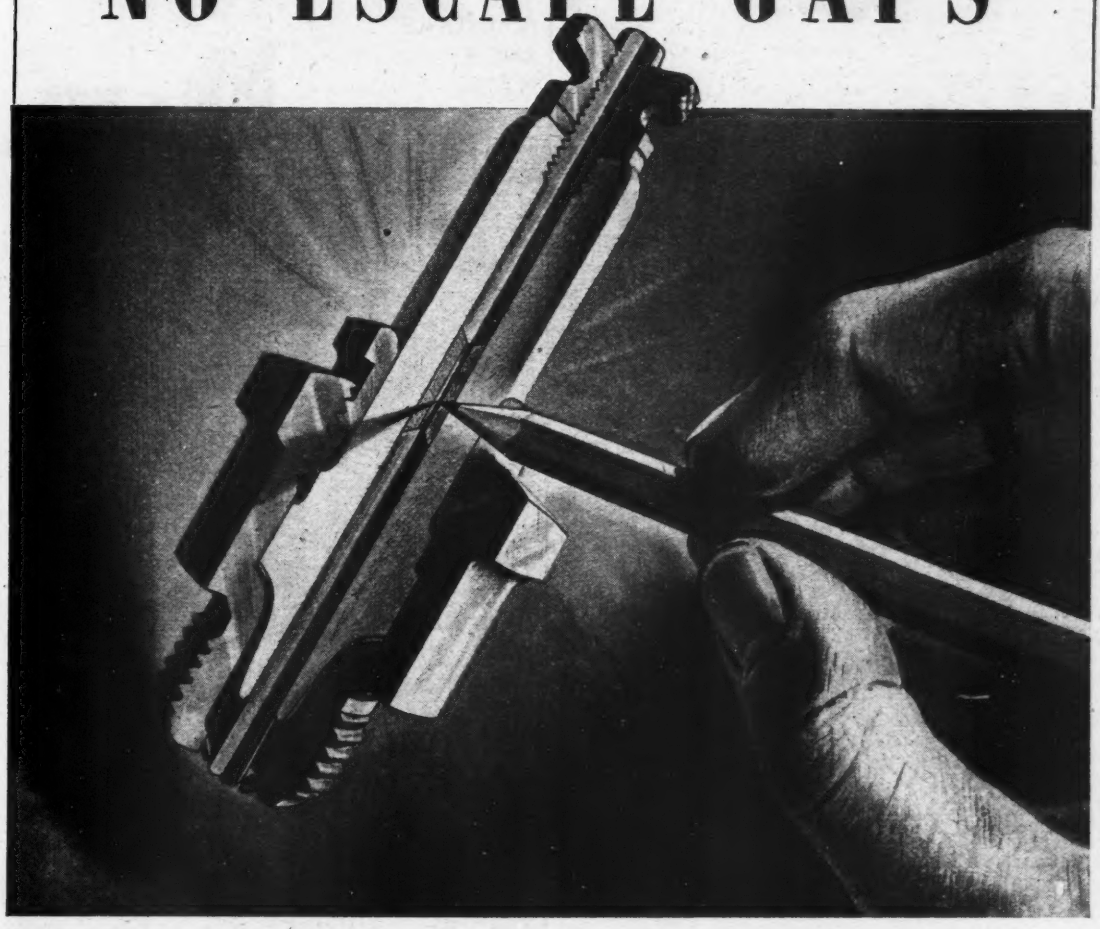
"Route Manuals"

The U.S. delegation announced that it had proposals to put forward on "route guides" and "operations manuals," based on studies already made in America. A new committee was, therefore, established to consider these—a committee which gave, incidentally, the first sound indication as to which countries definitely intend to operate in the area, for it was decided to confine membership of the committee to those countries. Representatives from Canada, Denmark, France, the Netherlands, Sweden, the U.K., and the U.S. joined this committee. In addition Ireland and Portugal are associated with the committee's work.

Each committee is reviewing existing facilities which are assured of continued operation for another eighteen months on the routes, as this period is considered the minimum time necessary to prepare the permanent organisation. The Communications Committee, meeting under Mr. T. J. Monaghan (Ireland) is considering the allocation of one set of frequencies to east-bound traffic and one set to west-bound traffic, and trying to determine the frequency with which an aircraft should report its position. There are rival views on 30, 60 or 90 minutes, with an alternative recommendation for reporting at specified geographical positions. At this stage an effort is being made to decide the longest "safe" interval in order to avoid the jamming of stations with messages. Existing Loran stations and chains are being examined for adequacy. Similar attention is being given to radio ranges as the route to Shannon Airport employs this system.

The airfields section of the conference is seeking agreement on the dimensions and strengths of runways and aprons, apart from airport ground aids to navigation—work which is closely related to the Traffic Control Committee which has to determine the limits of control on each air channel, and the limit of the airport control zone. A grid system of meteorological stations, incorporating stationary ships, merchant shipping, data from aircraft on the routes and from special meteorological flights and land stations, is to be adopted and standard forms for flight forecasts established.

NO ESCAPE GAPS



Aero engine experience proved that ordinary methods of filling the space between central electrode and insulator of a sparking plug with forms of cement were not good enough. Early in the war the difficulty was overcome by actually melting a silver electrode into the insulator. Later a form of glass powder was used and this was vitrified in place with complete success. All K.L.G. plugs for motor vehicles now incorporate this K.L.G. innovation.

K·L·G

CORUNDITE *plugs*

K.L.G. SPARKING PLUGS LIMITED, PUTNEY VALE, LONDON, S.W.15

AIRSCREW

WELLINGTON

Names that have made History

WELLINGTON • HALIFAX • LANCASTER
HURRICANE • BARRACUDA • AUSTER
SEA OTTER . . . all fitted with "THE ACE OF BLADES."

WEYBRIDGE

AIRCRAFT PROPELLER

BLADES

THE ARSCREW CO. LTD. WEYBRIDG.

TWW

MACHINE SHOP ACCESSORIES

ADJUSTABLE ANGLE PLATES

TILTING TABLES

LATHE CARRIERS

PARALLEL PACKINGS

CAST IRON VEE BLOCKS

STEADY RESTS

MARKING OUT TABLES

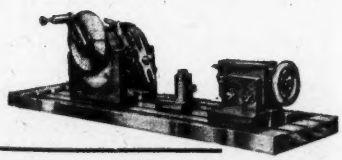
PRECISION CIRCULAR MILLING TABLES

FLOATING REAMERS

TUNGSTEN CARBIDE TIPPED TOOLS

TOOL GRINDERS

SURFACE PLATES



DIVIDING HEADS

SUDS PUMPS
A.C. Motor Driven. 5, 8 and 25 g.p.m. Capacities.

BELT DRIVEN GEAR PUMPS with ¾", 1" and 1¼" Branches.

Swivel Base Machine Vices.
Swivel Jaw Machine Vices.
Taylor Pattern Machine Vices.

LATHE CHUCKS
3 or 4 Jaw.

Steel or Cast Iron Bodies. Independent or Geared Scroll.

Write now for a copy of our latest catalogue.

THOS. W. WARD LTD.
ALBION WORKS, SHEFFIELD

Telephone : 26311 (15 lines). *Telegrams : "Forward, Sheffield."*

LONDON OFFICE : Bretenham House, Lancaster Place, W.C.2.

CIVIL AVIATION NEWS

ORDER FOR WAYFARERS

A NUMBER of Bristol Wayfarer aircraft have been ordered from the Bristol Aeroplane Co. by Channel Islands Airways. They are to be operated from Croydon and Southampton to Jersey and Guernsey, and it is hoped that some of them may be in service for the summer holiday season. Deliveries are expected to begin in May.

TUDOR II TRIAL

THE Avro Tudor II took the air for the first time last Sunday, when it made its first test flight from Woodford airfield, near Manchester. The pilot was Mr. S. A. ("Bill") Thorn, chief test pilot to Messrs. A. V. Roe and Co.

Seventy-nine of these aircraft have been ordered for use by the Ministry of Civil Aviation. This figure was given in the House of Commons on January 24th, by Mr. Ivor Thomas, the Parliamentary Secretary to the Ministry.

SIR WILLIAM HILDRED HONOURED

SIR WILLIAM HILDRED, the Director-General of Civil Aviation, has been appointed a Grand Officer in the Order of Oranje Nassau by H.M. the Queen of the Netherlands, in recognition of support and services rendered to K.L.M. Royal Dutch Airlines during the war. The award was announced by the Netherlands Minister in London, Baron Bentinck van Schoonheten, at a luncheon in London on March 4th to celebrate the reopening of the K.L.M. London-Amsterdam service.

CONSTELLATION DELIVERIES

DELIVERY of the first of B.O.A.C.'s five Lockheed Constellations can be expected next month, and the other four in May, according to a statement made in Washington last week-end by Mr. Peter Masefield, the British Civil Air Attache. He said that B.O.A.C. would obtain delivery of their Constellations before many other customers who were waiting for them, and that a regular service between London and New York should be possible by mid-July, using these machines.

NORTHERN CHARTER

THE Lancashire Aircraft Corporation, whose first charter flight was run from Squire's Gate a short while ago, was engaged, during the war, in the repair of Beaufighters. The company, as already announced in *Flight* of January 31st and March 7th, has now turned its attention to charter and air taxi work, using three D.H. Rapides. In addition, it is hoped soon to obtain three Percival Proctors. For the moment, the operating bases are Stanley Park—with the prospect of a move shortly to Squire's Gate—and Samlesbury, Preston.

EUROPEAN NETWORK

B.O.A.C. have now introduced additional European services as an extension to the existing network. The new services are to Oslo, to Copenhagen, and to Athens. The Athens service visits Marseilles and makes a night-stop at Rome *en route* in each direction. Sixteen-seater Dakotas are being used, half the seats being taken up by non-priority passengers.

The European Division of B.O.A.C. will be moving into their new Headquarters at Northolt within the next week or two and will be able to control their services "on the spot." The following list shows the European scheduled services and the latest details of fares and frequencies:—

Destination	No. of Priority Seats	No. of Commercial Seats	Frequency in each direction	Single Fare
				£ s.
Paris ...	8	8	2 daily	7 10
	9	7	1 ,,	
Amsterdam...	8	8	2 ,,	8 10
Brussels ...	8	8	2 ,,	6 0
Stockholm ...	8	8	6 weekly	30 0
Madrid ...	9	—	2 ,,	28 5
Gibraltar ...	8	8	1 ,,	42 0
Lisbon ...	5	5	5 ,,	36 0
Copenhagen	8	8	4 ,,	22 10
Oslo ...	8	8	3 ,,	21 0
Marseilles ...	8	8		15 0
Rome ...	8	8	1 weekly	27 0
Athens ...	8	8		43 10

RESTRICTIONS REMOVED

THE wartime system of passenger-briefing has, at last, ceased, and passengers travelling by B.O.A.C. aircraft are now to be given all the flight information which they require at the travel agency at which they book their passage. In the past it has been customary for B.O.A.C. passengers to travel to London some days in advance of their air journey for a briefing at Terminal House, an arrangement necessitated by the need for security and the frequent changes of regulations in wartime. The new system provides a welcome relief from these restrictions.

Another relief from restriction is that B.O.A.C. aircraft flying on the European services are now bearing civil markings, and are being operated by crews wearing B.O.A.C. uniforms. The same aircraft are, however, in use.

REDUCED FARES

A REDUCTION in fares across the North Atlantic has been agreed in New York by representatives of France, the Netherlands, the Scandinavian countries, the U.K., and the U.S.A., who are attending the North Atlantic conference of the International Air Transport Association. The reductions, which represent a successful beginning of international regulation of fares and air service frequencies, are as follows:—

New York to:—	Old Rate £ s.	New Rate £ s.
London	93 15	90 0
Shannon	83 10	79 15
Amsterdam	99 15	98 10
Copenhagen	116 5	109 0
Oslo	117 10	113 15
Stockholm	123 15	113 15
Lisbon	97 10	93 15

LANCASTRIAN RECORD

THE fastest Britain to New Zealand trip was made last week by a R.A.F. Transport Command Lancastrian, which took off from Northolt on March 6th and landed at Ohakea Airport, 100 miles north of Wellington, 62 hr 5 min later. The actual flying time was 55 hr 15 min. The flight was a special training flight and the aircraft carried two complete crews, one crew flying the aircraft while the other crew rested.

The Lancastrian flew from Northolt to Shaibah, at the head of the Persian Gulf, non-stop in 13 hr 35 min, a distance of 2,990 miles by the direct R.A.F. route. After a stop of 1 hr 57 min, it took off on the next stage from Shaibah to Negombo, Ceylon (2,580 miles) taking 11 hr 57 min. After another short stop, it flew on to the Cocos Islands (1,770 miles), refuelled, and then carried on to Guildford, near Perth (1,835 miles). Up to that point it had completed the journey from Britain to Australia in 45 hr 45 min.

The aircraft carried three copies of the previous week's issue of *Flight*, which were delivered, one to the High Commissioner, one to the "New Zealand Herald," and one to the New Zealand Press Association.

PACIFIC AFFAIRS

MANY rumours have arisen as a result of the conference in Wellington, New Zealand, at which Lord Winster and Viscount Knollys were present, and at which South Pacific airline operations were discussed. On his return from the conference, Mr. Arthur Drakeford, the Australian Minister for Air and Civil Aviation, said that a Pacific air service was likely to begin this year as soon as various details, including reciprocal landing rights, had been settled.

From various messages received, it seems that there is to be a South Pacific Air Transport Council which will study all aspects of South Pacific routes and operations. The council will include reresentatives of Australia, New Zealand and the U.K. and will have a permanent secretariat in Australia. Apparently, the conference recommended the establishment of a corporation, to be called "British Commonwealth Pacific Air Lines." This corporation will operate a joint British, Australian and New Zealand airline between Sydney and Vancouver, and Auckland and Vancouver, in parallel with a Trans-Canada Air Line's Service. The route is expected to be Sydney, Fiji, Canton Island, Honolulu, San Francisco, Vancouver. Australian National Airways will run a service between Australia and Vancouver in the meantime.

Lord Winster is making calls at Surabaya, Rangoon, Singapore, Calcutta and Cario on his way home, and it is unlikely that any official statement will be issued before he reaches England.

American Newsletter

Overseas Sales : Loan Effects : Airfield Comparisons—Idlewild v. Heathrow : The Constellation Purchase

By "KIBITZER"

THE future and the development of their overseas markets is worrying the American aircraft manufacturers. There have lately been some heavy broadsides fired at those departments of the Government which are responsible for export trade, the general aim of which has been to try and obtain greater official assistance in creating—and holding—foreign customers. The appointment of the overseas representatives of the S.B.A.C. seems to have caused alarm, and there is a general feeling that the British are a jump ahead, and that similar action, possibly by the Government, should be taken here.

The situation was not improved when the Foreign Liquidation Committee, which controls the disposal of American equipment already abroad, suggested that American aircraft manufacturers should set up service depots overseas to look after the surplus (and often obsolete) machines sold by the F.L.C. to foreign customers. This the manufacturers seemed unwilling to do, wishing rather to concentrate on manufacturing and selling new types before incurring the heavy outlay which the organization of such service depots would entail. It was then suggested that those firms which had aircraft in foreign hands should pool their resources and set up a jointly-owned servicing system as a temporary measure. The outcome of this idea is not known, but all through these deliberations runs the theme that, unless something is done quickly, the British will get ahead in foreign sales.

It is a well-known thing that, whenever there is fierce competition, be it that of war or in peace, one always imagines that the other fellow is not only having a much more trouble-free time than oneself, but is also cooking up a witches' broth of new ideas that is just about to boil over and give him some magic advantage. Subsequent investigation generally shows such fears to be exaggerated, and this is what seems to be happening now. The Americans believe that the British have a wide network of commercial activities and that—although they are obviously short on the actual goods to sell—they will be able to hold the buyers until production of new aircraft starts. The British, on the other hand, believe that the American aircraft manufacturer has already established a stranglehold on the overseas markets and that, with his commercial aircraft in production on a large scale, he cannot help but capture the business almost in its entirety. Obviously the answer lies somewhere between the two, but the American determination to go out after every possible market—particularly that in South America—must not be underestimated.

* * *

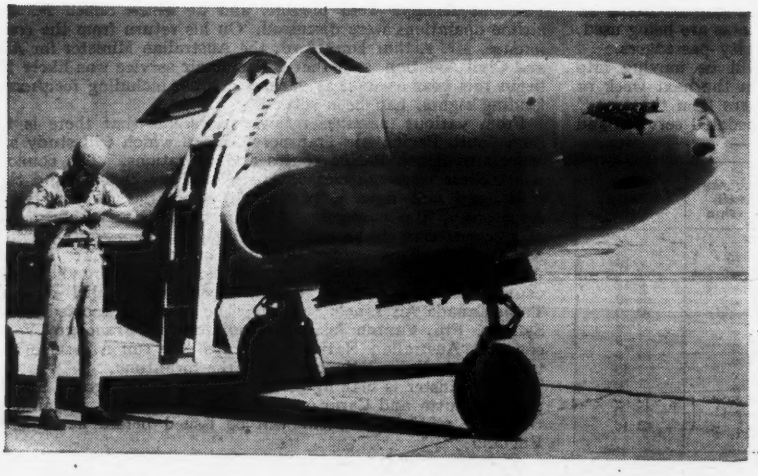
A factor which may have a wide effect on British overseas competition and which is sometimes overlooked by observers in the U.S., is the fate of the British loan proposal, which is soon to be debated in Congress. American politics, like our own, are playing an increasingly large part in international aviation, but, unfortunately, political procedures and reactions over here are not easily understood by foreign observers. The forthcoming debate on the loan is not likely to be any exception. It will therefore be as well for the British public to prepare itself for what can only seem to them to be an unjust and probably undignified discussion.

The opening shots have already been fired during a nation-wide broadcast by Senators Burton K. Wheeler and Edwin C. Johnson, both of whom are noted for their reactionary viewpoint and who were isolationists prior to Pearl Harbour. They are both bitter opponents of the Bill, Senator Johnson describing it as "this damnable loan proposal," and Senator Wheeler saying "If we have $4,000,000,000 to give away, let us turn our attention to the United States where we have some very difficult problems . . . ." His use of the verb "to give" in this statement may seem a surprising misrepresentation, but it is the contention of the loan's antagonists that it will not be repaid. The Senator therefore uses this word intentionally, not because he has not studied the terms and wording of the agreement, but because his listeners are hardly likely to have done so, and will probably accept his interpretation of the terms.

Similar speeches are bound to follow, and even the Bermuda agreements—which some Senators believe to have been a victory for British interests—may become a part-issue of the debate. Fuel will also be added to the anti-British fires, already more than smouldering, by the irresponsible sections of the Press. It is even possible that the loan itself may be turned down, or modified to such an extent that it is unacceptable. For all of this one must be prepared.

To those in England who have suffered so much during the war, and who are even now pulling in their belts instead of letting them out as is the case over here, all of this must seem most bitter ingratitude, but it must be remembered that these charges come mainly from a vociferous minority. It is almost certainly correct to say that if the objects of the loan were fully explained to them, the bulk of the American people would be in favour of it. As it is, the majority of them are probably ignorant of, and apathetic to, the important aspects.

Such criticism cannot, of course, be



The Lockheed (P80a) Shooting Star which mounts nose armament of six 0.5 in. machine guns. A special cockpit ladder is provided for the pilot.

Another Avro record . . .

England to the Cape in 32 hrs., 21 mins.

by the famous Avro Lancaster "Aries" . . .

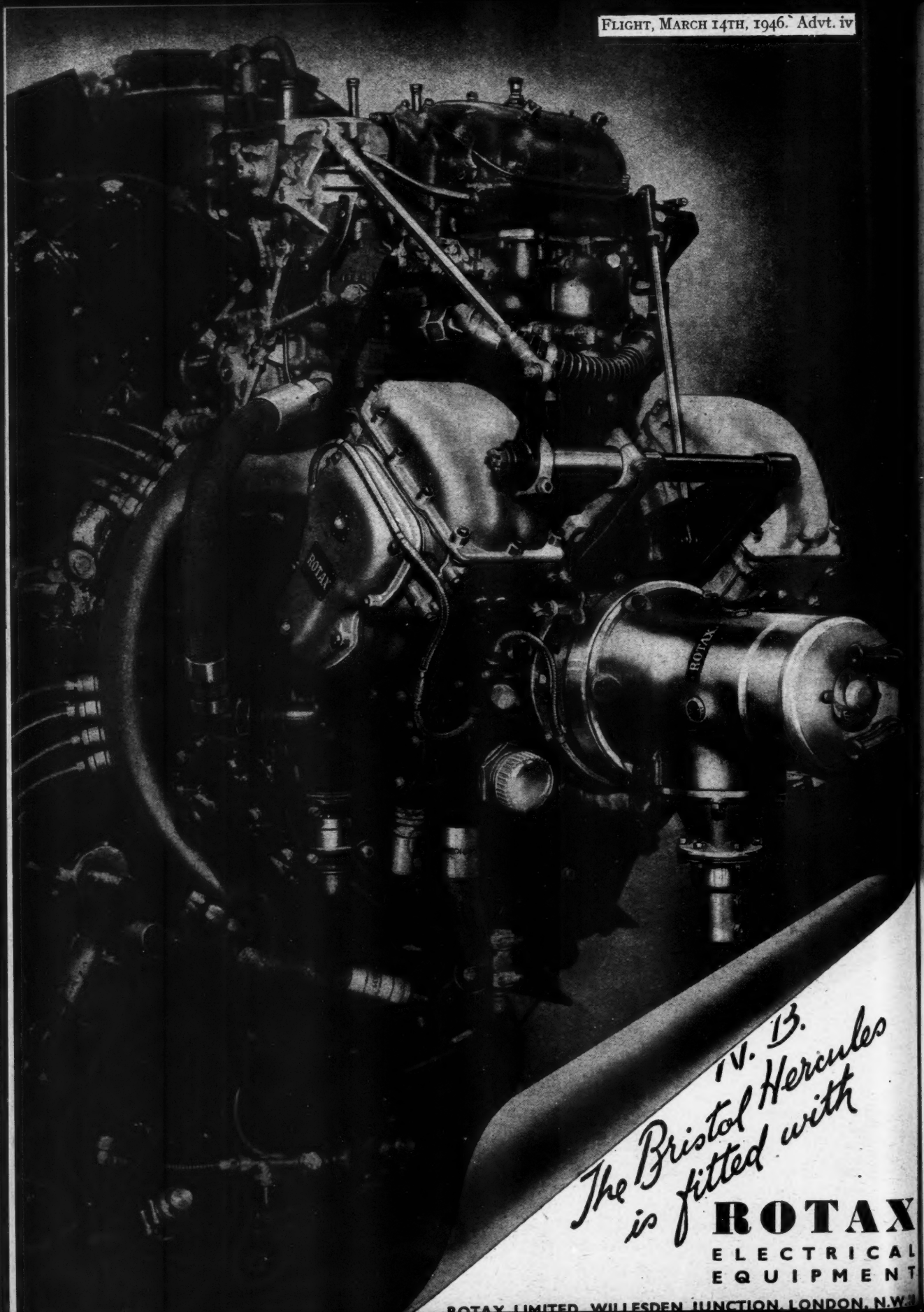
The setting up of this record by the Avro Lancaster 'Aries' is yet another example of pioneering work by Avro aircraft in establishing British air lines throughout the world.

LANCASTRIAN YORK TUDOR I TUDOR II

Superplanes by

AVRO

A. V. ROE & CO., LIMITED, MANCHESTER (Branch of Hawker Siddeley Aircraft Co. Ltd.)



IV. 13.

The Bristol Hercules is fitted with

ROTAX

ELECTRICAL EQUIPMENT

ROTAX LIMITED WILLESDEN JUNCTION LONDON N.W.10

AMERICAN NEWSLETTER

levelled at American business men, who are anything but apathetic. Although there are undoubtedly some who feel that the Bill is unwise, international business as a whole, and the aviation industry in particular, see that their future must be linked to world, and therefore British, trade, and realise the benefits that will result from its adoption. In any case, the next few weeks, however irritating to an Englishman, will be intensely interesting as the debate itself may well show the direction which American politics will take in future international problems. For this reason one hopes that the debate will be fully and understandingly reported in the British Press.

Anglo-American competition does not seem to be confined to aircraft or aircraft engines. In the February 1st issue of *American Aviation* there is an article pointing out that unless something pretty drastic is done to push ahead the construction of the New York Idlewild airport on the south shore of Long Island, the British terminal at Heathrow will be finished first. Having seen both sites this seems to me to be unlikely, but it does high-light the fact that there is still a great deal to be done at Idlewild.

Situated some four or five miles north-east of Floyd Bennett Field, which is owned by the U.S. Navy, Idlewild is made up entirely of reclaimed land, and if, as seems likely, time is needed for the ground to settle, it may be that, by 1950, some of the runways will be as bad as, or worse than, those at La Guardia, and that rebuilding and underpinning of hangars and buildings may be necessary. Heathrow should not suffer in this respect, and although it may get off to a slower start may well be completed first and have a more maintenance-free future than its American counterpart.

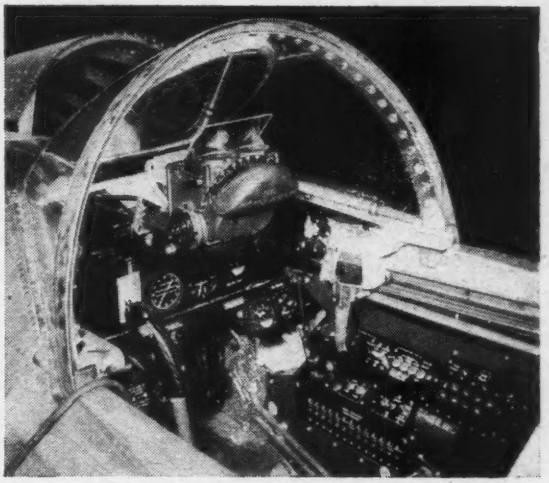
Terminal Communications

As far as road and rail availability is concerned, there does not seem to be much advantage to either site. At the moment neither has direct railway communication with the terminal city, but both can very easily be served by extensions to existing lines. The road connections to Heathrow are probably the better of the two, but there is no question that express highways will be constructed so that Idlewild will be within 35 to 40 minutes of mid-town Manhattan. On the other hand, the British airport has unobstructed road communication with the south, west and north-west, whereas everything coming or going to the Long Island site from the rest of the country must go through some part of New York City, where traffic tie-ups are frequent.

The weather question is an open one. Both sites suffer from man-made haze and fog—Heathrow in an easterly wind and Idlewild in a westerly one. Long Island south shore can also produce almost unflyable weather, due to sea fog, at certain times of the year. Instrument approaches to both airfields are good, but Idlewild will undoubtedly suffer because of the very close proximity of Floyd Bennett Field. This is almost certain to delay instrument landings and to cause traffic jams when incoming aircraft become "stacked-up" over both points. In fact, one of the legs of the Idlewild radio range is believed to pass right over Floyd Bennett, which is itself a large airport with very considerable Naval air traffic.

Idlewild has an advantage inasmuch as it is next door to a ready-made seaplane base, which could easily be dredged to the required depth—and part of which is even now being used by Naval and Coast Guard flying boats. It should also be possible to run a fast motor boat service from the airport, through the inland water, past Floyd Bennett, and across the outer edge of New York harbour to the New Jersey shore, or even to Jersey City itself. This would probably be a quicker journey than by road, which takes one through Queens, under the East River, through Manhattan, and under the Hudson River.

Some system will also have to be found to lay the dust at Idlewild, presumably by oil spray, for a 35-mile an hour wind, not uncommon in both summer and winter, soon turns the whole area into a cloud of sand.



The cockpit of the Shooting Star. It is not overcrowded by modern standards ; bomb and radio operation switches are on the right.

But even Idlewild, grandiose as it is, may be eclipsed by two new Philadelphia airports, plans for which are in preparation; their total cost will be 15,000,000 dollars.

While on the subject of airports, do not imagine that all the aerodromes and landing grounds in the States are built on such magnificent lines. The rules and regulations covering the establishment of private flying fields over here are far less stringent than they are in England.

* * *

Now that we have at last decided to buy American aircraft for some of our Atlantic routes, how many people realise that the basic design of the Constellation was frozen in 1939? This rather remarkable fact shows how very far-sighted Lockheeds were. It should be remembered that the idea of 100,000 lb aircraft, of cabin pressurisation, tricycle undercarriages, water injection, boosted controls and the like were then little more than a gleam in the designer's eye—and although aircraft had been built which embodied one or other of these features they were more or less experimental at that time. The fact that it was decided to go ahead with these features on a machine of this size gives some idea of the forward thinking that was current even before the war.

Quite naturally the purchase of these machines for B.O.A.C. has been a topic of considerable conversation, but it should be on record that in no single discussion that the writer has heard has there ever been any suggestion of an "I told you so" attitude. It seems generally understood that, through no fault of our own we were in a position where we had to buy outside, and there is a feeling of sympathy and a full realisation that this is only a temporary policy anyhow. Quite a number of members of the aircraft trade here feel that, in the end, this may be to their disadvantage, as it will give us a breathing space to prepare for the next jump ahead, and that as a result of our experience of their types, we shall be able to improve our own designs. Let us hope that this will be the case.

There is, however, one thing which people here have difficulty in understanding, and that is why we have wasted so much time on what they consider to be obsolete designs, and why we continue to build to out-of-date specifications when we could have started off with a clean slate. The feeling is that we should have purchased American aircraft straight away and not worried about converting military aircraft. Whether such criticism is justified remains to be seen.

Stress Without Strain

Part II of a Simplified Method of Airscrew Blade Stressing

By ANTHONY A. FLETCHER, M.A. (Oxon.)

(*Continued from page 245*)

TURN now for a moment to Fig. 1. It is common practice amongst the elite of the airscrew world to define the characteristics of an airscrew in terms of an arbitrary "Master" Section, usually that at 0.7 or 0.75 of the radius. Let us now, therefore, in what follows copy the example of our betters and select section E–E as our "Master." In our "Standard" airscrew this is situated at 0.75 radius. Fig. 8 is a curve showing the centrifugal stress on any section of our standard airscrew, expressed as a multiple of that on E–E.

Now centrifugal stress varies as the square of the r.p.m., the square of the airscrew radius, and directly as the weight of the material. Consequently, provided that the sections of any airscrew bear the same proportional relationship to one another as obtains in our "Standard Model," it is but a matter of moments to find the centrifugal stress at any section. Suppose, for example, we are faced with such an airscrew of 12ft 6in diameter, revolving at 1,200 r.p.m., and made of material weighing 80 lb per cubic foot. Somebody wants to know the centrifugal stress on section B–B. Very well, the stress on E–E will be

$$\frac{1{,}450 \times (75)^2 \times (1{,}200)^2 \times 80}{10^{12}}$$

which equals 940 lb/in², and the stress on B–B will, therefore, be 940 × 2.076, which equals 1,952 lb/in.². Again, how simple!

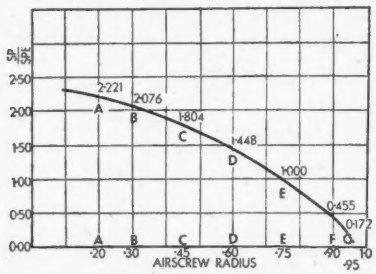


Fig. 8. Centrifugal stress as multiple of that on section E-E.

We are getting on now, but there is still a little way to go before we can find our answer presented to us, so to speak, on a plate. We know the thicknesses of our airscrew sections when the permissible stress is 10,000 lb per in² and when the centrifugal stress of our "Master" section E–E is 1,450 lb per in²; in other words, when the "Stress Ratio" is $\frac{1{,}450}{10{,}000}$ or 0.145. Under these conditions the thicknesses of the various sections are given as multiples of the thickness at E–E by Fig. 8*a*. But a little thought will show us that with different values of "Stress Ratio," these multiples will vary, for, quite obviously, if we still keep our maximum permissible compressive stress at 10,000 lb/in² and have only, say, 1,200 lb/in² instead of 1,450 as relief load on E–E, the thickness of E–E, and consequently all the other sections, will have to be greater.

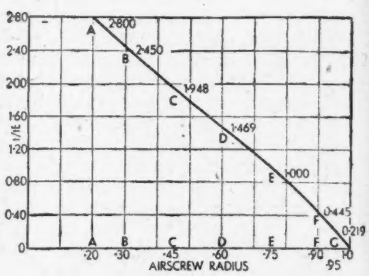


Fig 8a. Section thicknesses as multiples of that on E-E for stress ratio of 0.145.

Therefore, to complete the good work, another set of charts has been worked out for different values of "Stress Ratio" from 0.10 to 0.20, a range which seems adequately to fulfil requirements so far as non-metallic airscrew materials are concerned. The results are given in Figs. 9 to 14, where the thicknesses of the various sections are

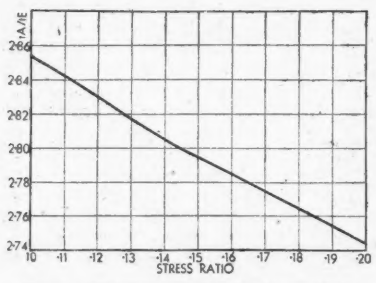


Fig. 9. Thickness multiples for section A-A.

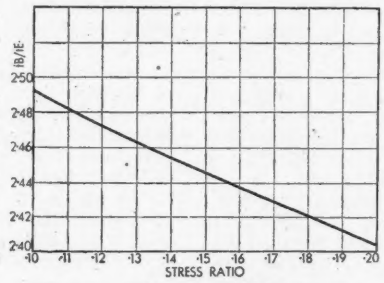


Fig. 10. Thickness multiples for section B-B.

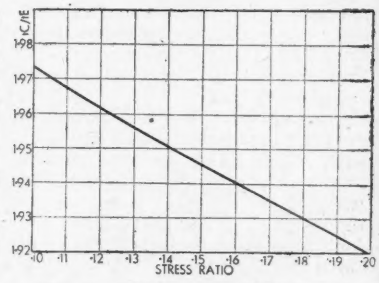


Fig. 11. Thickness multiples for section C-C.

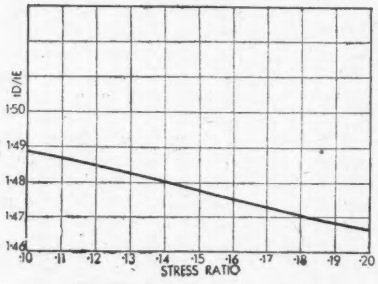


Fig. 12. Thickness multiples for section D-D

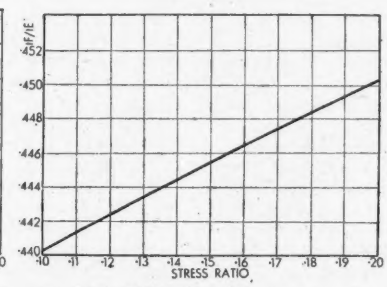


Fig. 13. Thickness multiples for section F-F.

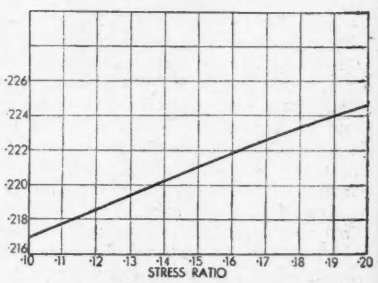


Fig. 14. Thickness multiples for section G-G.

The first jet propelled fighter in operation with the allied forces

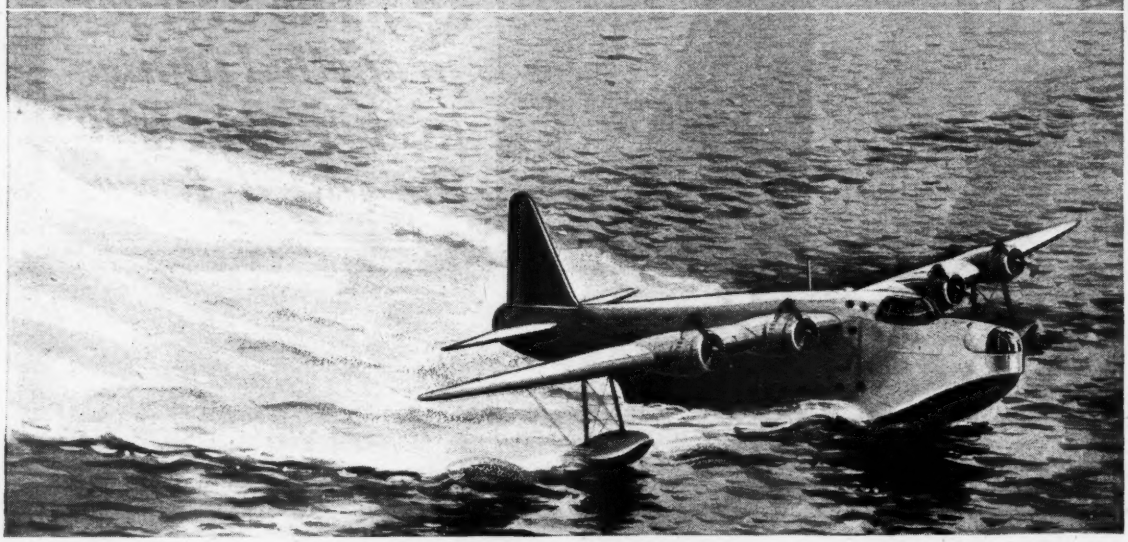
GLOSTER METEOR

ROLLS ROYCE DERWENT ENGINES

GLOSTER AIRCRAFT BRANCH OF HAWKER SIDDELEY AIRCRAFT CO., LTD.

DOCKERS AIRCRAFT FINISHES

— will still be used on the Aircraft which will fly the trade routes of the Post-War World



DOCKER BROTHERS - LADYWOOD - BIRMINGHAM 18

This century will be the most momentous since life began. Atom-propelled planes will girdle the earth. To aero engineers this breath-taking era will be the Century of Tubes.

FORGE-CRAFT

(WOOD GREEN) LTD., 28 CRAWLEY RD., LONDON, N.22. Tel.: BOWES PARK 2493

expressed as multiples of our "Master" thickness at E–E. Bear in mind what was said beforehand anent centrifugal stress; since the areas of all sections will be increased (or diminished) proportionately, and in the same proportion as those of our "Standard" airscrew, the centrifugal stress will remain constant, although the total centrifugal pull will vary very considerably.

By now the reader—if he or she has had the patience to get so far—has in all likelihood become rather perturbed, and has begun to think, "Good Heavens, have I got to work all this stuff out for myself before I can get the answer I want?" No, indeed; and to show how simple the whole thing is, I suggest that we take, here and now, another hypothetical airscrew and work it out by means of the charts given in this article. It would add a slight spice of fun and excitement to time oneself, and see how long (or rather, how short!) a time one takes over the business.

We will suppose, then, that the airscrew has the following characteristics:—

Diameter = 12ft.
R.p.m. = 1,200.
"Activity Factor" = 81.
Air load per blade = 950 lb.
Weight of material = 80 lb/ft³.
Permissible compressive stress = 7,000 lb/in².

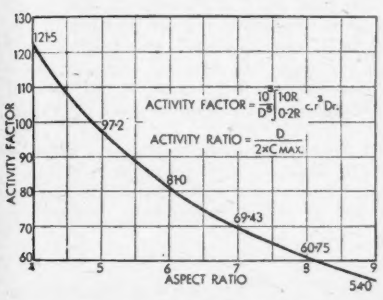


Fig. 15. Curve of Activity Factor against Aspect Ratio.

We have to find the thicknesses of the various sections such that the compressive stress on each one is the maximum permissible. First of all, a word or two about the "Activity Factor." This is a parameter that has fairly recently come into general use. It can be defined as a non-dimensional function of the plan form, designed to express the integrated capacity of the blade elements for absorbing power. In many ways it conveys a much better idea of an airscrew's capabilities in this line than the old-fashioned "Aspect Ratio," though for our own particular needs we shall want this latter.* So another chart, Fig. 15, has been made to show how "Activity Factor" corresponds to "Aspect Ratio." Off we go, then:—

From Fig. 15. A.F. of 81 = A.R. of 6.

$$\therefore \text{C max. (or } Cc) = \frac{144}{2 \times 6} = 12.0\text{in.}$$

From Fig. 1. $C_E = Cc \times 0.785 = 9.42\text{in.}$

From Fig. 4. $BM_E = 0.04753 \times 950 \times 72 = 3{,}256$ lb/in.

From Fig. 8. $SP_E = \dfrac{1{,}450 \times (72)^2 \times (1{,}200)^2 \times 80}{10^{12}}$

$= 865$ lb/in².

Then $Zc_E = \dfrac{3{,}256}{7{,}000 + 865} = 0.414$ in³.

And $t_E = \left(\dfrac{0.414}{9.42 \times 0.08}\right)^{\frac{1}{2}}$

$= 0.7411$ in.

"Stress Ratio" $= \dfrac{865}{7{,}000} = 0.1236$

We now, without any further bother, write down the chord and thicknesses of the remaining sections.

Section	Chords		Thickness	
A–A	10.80	Fig. 1.	2.095	Fig. 9.
B–B	11.52		1.830	Fig. 10.
C–C	12.00		1.453	Fig. 11.
D–D	11.40		1.100	Fig. 12.
E–E	9.42		0.7411	—
F–F	6.00		0.3280	Fig. 13.
G–G	4.50		0.1622	Fig. 14.

Just to show that there is no "catch" anywhere and that all is straight and above board, the detailed stresses are given below:

(1) Section	(2) Zc	(3) BM (lb/in)	(4) lb/in (comp:)	(5) Sp.	(6) Ult. stress lb/in² = (4) — (5)
A–A	3.792	33,810	8,915	1,923	6,992
B–B	3.087	27,140	8,792	1,795	6,997
C–C	2.027	17,340	8,555	1,560	6,995
D–D	1.104	9,095	8,241	1,250	6,991
E–E	0.414	3,256	7,865	865	7,000
F–F	0.05165	382	7,395	395	7,000
G–G	0.00947	67.6	7,141	149	6,992

Looking at the final figures, I think that the most carping critic will admit that the accuracy is quite reasonably close to the desired answer, allowing for the fallibility of the human factor in reading charts. At any rate, every precaution has been taken to make it so, as a faulty tool is no good whatever, however "slick" in operation.

So there we are. In a very few minutes, and at a minimum expenditure of time, trouble, and temper, we have fixed the scantlings of an airscrew blade stressed most economically up to just on 7,000 lb/in², the permissible limit for the material. Furthermore, we know from practical experience that such a blade will run under load sweetly, smoothly and without flutter. Everything in the garden is, in fact, lovely, and Bob shows every sign of being our uncle.

Stop! But does he, though? Listen to the critics. "You have failed lamentably in what you set out to do. You have made no mention whatsoever of restoring moments due to centrifugal force when the blade deflects under load; you have said nothing about feasibility of introducing a centrifugal bending moment of opposite sign to the air bending moment by tilting the blade forward in elevation. Your answer, please?"

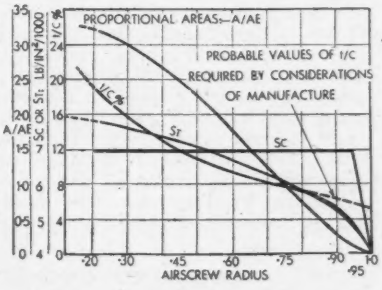


Fig. 16. Characteristic curves for an hypothetical airscrew.

Dash these critics! They are, of course, as always, quite right. I am guilty of both these glaring omissions, but for reasons that seem to me, at any rate, fairly sound. Dealing first with centrifugal restoring moments: if pushed to its logical conclusion, the admission of this factor would lead to scantlings so absurdly slender that the blade would whip and twist horribly under load. Some early French wooden airscrews were notorious offenders in this respect, and even to watch them "revving-up" on the ground gave one a queer feeling in the pit of the "tummy," whilst everybody took very good care to avoid standing in the plane of rotation! However, as some wit aptly remarked, they were usually "too weak to break".* Again, we must bear in mind that all engineering is of necessity more or less a compromise. Considerations of stiffness, rigidity, and limitations of manipulative and manufacturing possibilities all combine to render impossible of attainment that beautiful ideal which theory dangles so enticingly before our eyes. It is believed that, for non-metallic airscrews, the dimensions arrived at in this article are as small as are desirable. At any rate, they work well in practice, and, ultimately the proof of the pudding is in the eating thereof!

Now for the second objection:—The introduction of a forward tilt to the blade, in order to provide a relief to the compressive bending stresses, is a trick that has often been used, especially in ordinary wooden airscrews, but I believe, personally, that it is one of those things which are better done without, if possible. For one thing, the amount of tilt can only be right for one particular set of operating

* The late E.V.B. Fisher of early Brooklands memory.

STRESS WITHOUT STRAIN

conditions. For another, and more important reason, it is a lamentable fact that the conditions for minimum radial stress and minimum torsion are mutually contradictory, and, furthermore, that the calculation of the torsion upon an airscrew blade—particularly a non-metallic one—is an evil thing, not lightheartedly to be undertaken, but only under stress of dire urgency, or as a penance!

So let us leave it at that. I am fully conscious of the shortcomings of this article, and shall await, unperturbed nevertheless, the mass of recrimination and caustic comment which I fully expect to be hurled at my head, but the latter object, seasoned and toughened by many years in the aircraft industry, will still remain unbowed!

One small point. It will probably be found that, in the case of non-metallic airscrews, the dimensions as given by the charts for sections F–F and G–G will be too slender from handling and manufacturing standpoints. These sections will, therefore, have to be increased slightly in thickness so that, whilst conforming to a good aerofoil shape, their leading and trailing edges are not too frail. This thickening will, alas! lead inevitably to some slight loss of efficiency and should, therefore, be kept as small as possible. The ultimate compression stresses in other sections will, of course, be slightly reduced by the increased centrifugal pull. The physical characteristics of our hypothetical airscrew are given, by way of conclusion, in Fig. 16.

LIQUID IGNITION

A METHOD whereby ignition in an internal combustion piston engine is obtained, not by means of sparking plugs, but by spontaneous ignition of a liquid finely sprayed into the combustion chamber, was perfected in Germany in 1942-3. The process, which was mentioned in the writings of Dr. Rudolf Diesel in 1898, was developed by the I. G. Farben Industrie A.G. and perfected in co-operation with the Bayerische Motoren Werke.

It was recognised by the Germans that the weakest part of an aircraft engine, especially for high-altitude operation, was the sparking plug. Not only was it necessary to take special precautions to avoid ignition difficulties at great heights, but it was also necessary to avoid fouling of the plugs by limiting the lead content of the fuel. The liquid ignition system, which is known as the "Ring-Process," is an invention for the elimination of sparking plugs and the conventional ignition auxiliaries. Ignition is produced by spraying into the combustion chamber at the right moment of the compression stroke a liquid that will spontaneously ignite at the temperature of the cylinder and thus ignite the combustible charge.

The ignition liquid is an ether such as Buda-diol-diethyl-ether or Diethyl-diglycol-ether, and its self-ignition quality operates with correct ignition from the leanest up to the richest air-fuel mixtures. This can be explained by the high energy of spray, estimated to be seven times that of the energy release from a sparking plug.

It can be said that the main advantage of the Ring-Process as compared with conventional ignition lies in the elimination of sparking plug difficulties. A saving in fuel of approximately 5 per cent can also be expected as a result of enhanced knock-free performance, and also of more economical use of fuel in the lean-mixture operating periods.

The process must be evaluated in relation to all new methods of powering aircraft; *e.g.*, jet propulsion, turbine/airscrews, rockets, etc. In this light the Ring-Process would appear to be a rather interesting but minor development.

GOLFING OCCASION

ACCORDING to the President of the Aircraft Golfing Society, Saturday afternoon golf has probably been the biggest aid to production during the war! Perhaps he was nearer the mark than he imagined when he made this comment at the second annual dinner of the Society at the Connaught Rooms in London on March 5th. As Sir Frederick Handley-Page suggested later in the evening, perhaps many of our international problems, too, would dwindle to insignificant proportions if they could be discussed over a drink and a game.

Among the guests were most of the twelve senior R.A.F. Fighter pilots who fought the society over the course at Stoke Poges last December. Two of them, Grp. Capt. Douglas Bader and Wing Cdr. P. B. Lucas, were amongst the eight speakers who variously proposed or responded to toasts. Other speakers were Grp. Capt. P. W. S. Bulman, F. Lestrade Brown of Pan-American Airways, Mr. I. E. Brimble and Mr. T. F. Clarke.

A Lockheed Constellation fitted out by the U.S.A.A.F. as a flying laboratory. A number of tests were made with water ballast, the weights being altered by pumping the water from tank to tank.

DISTANCE INDICATORS

THE British Commonwealth and the U.S. have signed an agreement on radio distance indicators on aircraft, the U.S. State Department announced last week. "The necessity for such joint action was brought about by the accelerated research programme pursued during the war and the need for providing frequencies for distance indicators developed by Canada, Britain and, more recently, Australia," the announcement said.

FORTHCOMING EVENTS

March 20th.—**R.Ae.S. Graduate and Students Section; "Radar" (Film show).
March 28th.—*R.Ae.S., "The Electrical Measurement of Strain," by Dr. S. C. Redshaw.
March 28th.—R.A.F. Club annual meeting at 128 Piccadilly, London, W.1, at 6 p.m.
April 4th.—†Metropolitan Region luncheon meeting, Institute of Motor Industry (London).
April 10th.—*R.Ae.S., "The Silencing of Aircraft," by Dr. Fleming.
April 16th.—**R.Ae.S. Graduates and Students Section; "Flight Refuelling," by Sir Alan J. Cobham.

** The Library, 4 Hamilton Place, W.1.
* Lecture Hall, Institute of Civil Engineers, Gt. George St., S.W.1.
† Lectures by Air Comdre. F. Whittle.

SMITHS

AVIATION INSTRUMENTS

have been chosen by

"Bristol"

for the

'FREIGHTER'

and

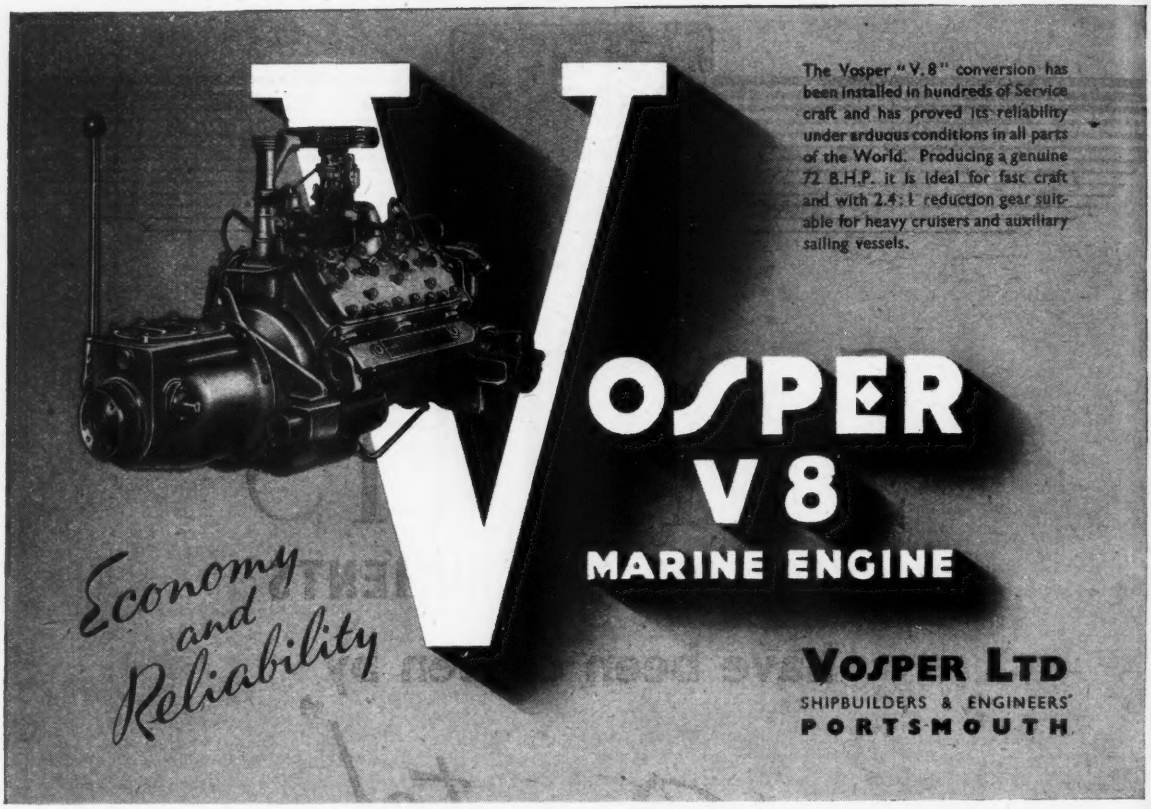
'WAYFARER'

SMITHS AIRCRAFT INSTRUMENTS LTD

CRICKLEWOOD WORKS, LONDON, N.W.2

THE AVIATION DIVISION OF S. SMITH & SONS (ENGLAND) LTD

A102a


The Vosper "V.8" conversion has been installed in hundreds of Service craft and has proved its reliability under arduous conditions in all parts of the World. Producing a genuine 72 B.H.P. it is ideal for fast craft and with 2.4 : 1 reduction gear suitable for heavy cruisers and auxiliary sailing vessels.
V
VOSPER
V 8
MARINE ENGINE
Economy and Reliability
VOSPER LTD
SHIPBUILDERS & ENGINEERS
PORTSMOUTH

JOHN HALL & SONS
(BRISTOL & LONDON) LTD., BRISTOL

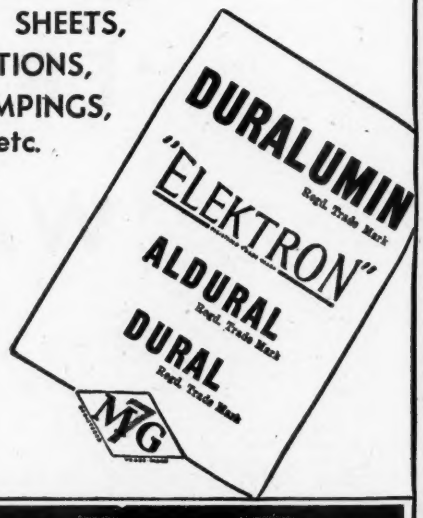
Makers of

Halls

RANGE OF AIRCRAFT FINISHES

welcome inquiries on the establishment and operation of paint shops, and place their laboratories at the disposal of aircraft manufacturers.

MANUFACTURED IN RODS, TUBES, FORGINGS, WIRE, STRIP, SHEETS, SECTIONS, STAMPINGS, etc.



JAMES BOOTH & COMPANY LIMITED
BIRMINGHAM, 7. *Telegrams:* "BOOTH, BIRMINGHAM."

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

NO CLUBSIDIES
Reward for Unselfish War Service

SO this is the reward! The reward for the thousands of hours unselfishly given to the Royal Air Force Training Command by the one-time "A" and "B" licence club pilots during the past six and a half years. At the time when things were at their worst (and at all other times) we were told that we were doing a marvellous job and that we could not possibly be spared for anything else.

Now it is all over we are to have our chief pleasure in life (and in a large number of cases our means of livelihood) taken away from us without a word of thanks. That is unless we are rich; the gratuity certainly won't go very far in this direction.

There is only one answer to it, and that is to get out of the country and go to our enlightened Colonies where men are men and know how to treat each other. I see Lord Winster has gone. May he live and learn. C. NEPEAN BISHOP.

AN EX-PILOT'S PLEA
Demobbed Desire Expressed in Verse

I DO greatly miss the occasional flip, and present hire or charter rates leave me in awe at what my training as pilot and wop/air gunner must have cost poor England. The following might perhaps be called "A Begging Letter":—

To wheel in space,
Free as a bird—though lacking of its grace!
Deep in my heart this hunger lies
That only they can know who know the skies.
The ache to ride the realms of space
To soar and glide,
Caring not who owns the countryside.
War taught, my craving is a taste beyond my reach.
To learn to ride the winds, I hoard
Each golden hour that I have known,
Bought by the nation, yet still my own.
Must this gift become a misery?
Its bitter waning ever torment me?
To make me cry ere many months have gone,
"Blind fool! Would that I had soldiered on!"
This will I beg: one hour in Sunday's noon!
Of anyone I ask my piteous boon,
That through the week "Ex-Aircrew," still air loyal,
May joyfully beset his civvy toil.

"474."

"LET US BE HONEST"
Or Shall We Play Them at Their Own Game?

WHENEVER I read an article like "Indicator's" plea for honesty (*Flight*, March 7th) I applaud the writer's moral outlook and sigh for the utter hopelessness of his cause. The trouble with the good old saying, "Honesty is the best policy," is that it is incomplete; it should add, "so long as *everyone* is honest."

Anyone in Britain who has regularly followed the news—not only in the world of aviation but in almost every other sphere—must be aware that there is a section of the American Press, lay and semi-technical, which has for some time been deliberately and purposefully dishonest in the furtherance of its anti-British propaganda. This goes much further than the mere self-advertising "ballyhoo" which is the normal American technique based on the cynical truism that if you tell the public anything often enough they'll believe it. Every aircraft they ever introduced has always been the best, the fastest, the most manœuvrable and so on *ad nauseam*. That much one can expect from a nation of habitual line-shooters, and treat it at its face value. But when I read in an American publication a short while ago that a certain American aircraft was "acknowledged to have won the Battle of Britain," then, I ask you, could rank dishonesty go further?

One could quote numerous similar instances in which American Press and publicity writers have not been satisfied merely to boost their own efforts, but have gone out of their way to belittle and deny Britain's contribution to victory and British achievements in general.

The trouble is that, so far as their own readers over there are concerned, they have a pretty wide measure of success. Many thousands of ordinary American citizens, particularly in the Middle West, still think that the B-17 was the only Allied bomber the Berliners ever saw, that Lend-Lease was a one-way street, and have never heard of the 14th Army. You may remember the reported case of the U.S. Red Cross nurse who arrived in Britain not long before V.J.-Day and was quite surprised to learn that we, too, were at war with Japan; and you can't blame that entirely on Errol Flynn!

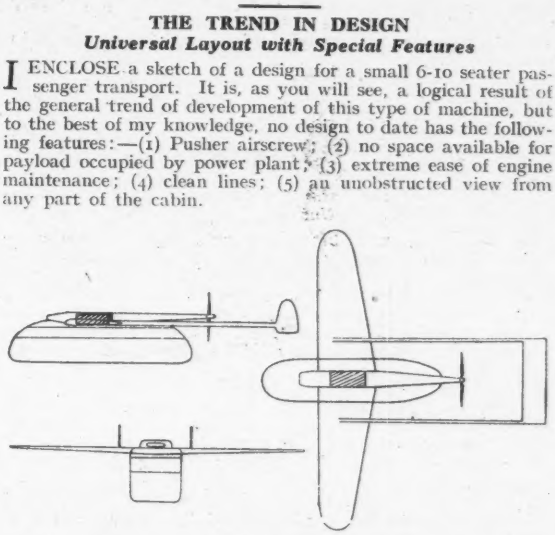
Please don't think I'm anti-American. I have met many Americans during the past few years and, individually, I've liked every one of them. But to use one of their own pet expressions, their national publicity methods stink. Honesty is not their idea of a policy with a pay-off, so if we start being even more honest than we already are, we shall just be increasing our own handicap—and God knows it's big enough already!

REALIST.

["Indicator" writes: "It seems that 'Realist' has fallen into the very trap which I feel should be avoided at all costs. Though I might cynically agree that honesty may be only its own reward (and usually a painfully small one) in matters of plain buy-and-sell business, I cannot see that any purpose is served by dishonesty in advertising. Carried to its logical conclusion, such a policy would mean that everyone would be shouting lies, and no one would believe a word that was said. The British have always maintained a most irritating 'holier than thou' attitude—surely the least we can do is to try to live up to it."]

THE TREND IN DESIGN
Universal Layout with Special Features

I ENCLOSE a sketch of a design for a small 6-10 seater passenger transport. It is, as you will see, a logical result of the general trend of development of this type of machine, but to the best of my knowledge, no design to date has the following features:—(1) Pusher airscrew; (2) no space available for payload occupied by power plant; (3) extreme ease of engine maintenance; (4) clean lines; (5) an unobstructed view from any part of the cabin.



The ideal engine would be of the horizontally opposed type, but a vee type would be easily accommodated. It would be necessary only to remove the cowlings and the entire engine and its auxiliaries would be open to view. The shaft to the airscrews would be direct. The engine or engines could be removed bodily, by craning them straight out of the top. Another feature as regards the airframe would be that the front and back portions of the body could be made to the same design. D. THEOBALD.

FIGHTER EFFICIENCY
Sea Fury and Meteor IV

IN your editorial of February 14th, you made a comparison between the performance of the Hawker Sea Fury and the Gloster Meteor IV in which you inferred that the "cleanness" of the Meteor is inferior to that of the Fury.

I must draw your attention to two errors in your comparison. First; you quote the level speeds as 460 m.p.h. and 585 m.p.h., but you do not mention that the Fury's speed of 460 m.p.h. occurs at about 20,000 ft, (336 m.p.h. indicated), whereas the Meteor's 585 m.p.h. is at sea level. Taking your figure of 1,500 lb thrust (which seems reasonable), we arrive at a drag figure of 133 lb at 100 m.p.h. for the Fury.

Second; you assume that the Derwent V engines give the Meteor 7,000 lb of thrust at 600 m.p.h. at sea level. A better figure would be 6,000 lb. The drag figure for the Meteor then

CORRESPONDENCE

becomes 175 lb at 100 m.p.h. Thus we see that the ratio of drags at 100 m.p.h is 175 to 133, and not 7,000 to 2500.

Incidentally, the Mach number associated with 460 m.p.h. at 20,000 ft is 0.65 and that corresponding to 585 m.p.h. at sea level is 0.77.

We all agree that the Fury and Meteor are both excellent aircraft, each in its own particular role, and it would be helpful if you would publish these comments in your next issue to avoid any misunderstanding that might arise in the minds of anyone not conversant with the two types.

J. LOBLEY,
Senior Aerodynamic Assistant,
Gloster Aircraft Co., Ltd.

[In taking 7,000 lb thrust for the two Derwent units we followed the figures officially released at the time a description of the aircraft was published. Our correspondent is, of course, in a good position to know the results obtained in service. We must plead guilty to overlooking momentarily the fact that the Sea Fury's speed of 460 m.p.h. is attained at height, and that therefore an allowance should have been made for this in the comparison.—ED.]

LIGHT AIRCRAFT

Scope for the Flying Representative

I READ with interest the points raised by Mr. Monkhouse, in his letter headed "Light Aircraft," in *Flight*, February 14th.

It seems to me though that he is slightly off the beam in stating "there is no ready-made market for light aircraft"; and still further off in saying "no one really wants to fly." Surely, the very fact that a high value can be set on speedier travelling is an indication that a ready-made market does exist. Such a market can be found in the commercial world. Many industries could operate their own light aircraft, to increase their home and overseas markets.

The trouble lies in overcoming the prejudice against the use of aircraft. The key to this problem, surely, is in the fact that there *are* people who want to fly.

Many experienced pilots are available to-day who have a good commercial and administrative background. These men would make excellent flying representatives. Also, as skilled pilots, their introduction would effectively clear the air of such cloudy problems as too dangerous and too complicated. The argument that it would be too expensive does not apply, because it would be a sound investment. Many industries spend more on useless forms of advertising than it would cost to operate several light aircraft. There is opportunity in this, too, for using that fully co-ordinated, non-competitive, fully sponsored initial effort that Mr. Monkhouse speaks about.

An agency could be formed, representing all light aircraft manufacturers, to operate a scheme of flying representatives, backed by an efficient ground service. In fact the main duties of such an agency could be as follows:

(i) Select suitable applicants as flying representatives.
(ii) Direct high pressure publicity campaign.
(iii) Organise ground service stations.
(iv) Carry out market research.

Each manufacturer would be required to allot a certain percentage of his output to the production of aircraft for flying representatives. As Mr. Monkhouse points out, what brings business to one brings business to all.

Furthermore, once the light aircraft was established as a practical means of boosting our export trade, the Government might well give free rein to the manufacture of these aircraft.

When that happy day arrives it will mark the beginning of a new era in civil flying. There is a host of skilled personnel ready to take part in it. Can they be denied?

ROY H. BRETT.

FOR THE BOOKSHELF

"Alone Over the Tasman Sea," by Francis Chichester; 10s., George Allen and Unwin.

IN the nicely organised brave new world towards which, subject to our escape from atomic disintegration, we are inevitably moving, books like this will need to be read by candlelight in the cellar, or by flashlamp under the bedclothes, after they have been bought in an underground market. For, obviously, and in all commonsense, it will not be advisable to remind the well-nourished and fully rationalised citizen of the incidental grandeurs of the old anarchic world which, for the sake of the happiness of the majority, have been duly overlaid with chromium plating.

Even now it is not conceivable that anyone should be allowed the personal freedom of movement which was Francis Chichester's when he set off in a Gipsy Moth seaplane to cross the Tasman Sea in 1931. At the merest mention of the project he would probably be taken into protective custody until such a time as he could find a four-engined aircraft, pass a First-Class Navigators' examination, find an experienced crew, obtain some coloured card to prove his blind-flying ability, and pass a very stringent medical examination. Even then, he would only be allowed to leave after depositing an unheard-of sum to cover the possible costs of a search—regardless of the fact that such a search would provide as useful an exercise for the local Air Force and Navy as it would be possible to imagine and that such an exercise (without the human interest) would probably have been carried out anyway.

For those who have not read *Seaplane Solo*—the title of the original edition—and for the benefit of the younger generation of flying people, it should be explained that this is the true and well-written story of a most extraordinary navigational adventure. The author wanted to fly from New Zealand to Australia; his Gipsy Moth would not cover the distance nonstop, so he borrowed some floats, studied astronomical navigation, and made the crossing by way of two tiny islands in the Pacific, each one of which had to be hit spot-on. He used a marine sextant in an aircraft which was longitudinally unstable, and plotted his position lines in a tiny open cockpit. Furthermore, his Moth was wrecked overnight after arrival at his second landfall—Lord Howe Island—and, with the help only of the islanders and with no technical knowledge, he rebuilt the entire aircraft before continuing to the Australian mainland. In his tiny cockpit world, tied round his neck or stowed elsewhere, Francis Chichester's equipment included a Bygrave position-line slide-rule, Roper's *Practice of Navigation*, charts, three protractors, two rulers and a pair of compasses, a sextant, a camera, spare magnetic compasses and watch, spare spectacles, films and knife, chronometer and barometer, a wireless transmitting key, a logbook, and, pasted to the cockpit side, a page of the *Nautical Almanac*, and conversion, dip and refraction tables.

I should find no difficulty in writing several thousand words both about the flight itself and about the literary merits of the book. There is space only for a few quotations and comments.

Word Impressions

Everyone who has waited, while daylight ebbed away, for an aircraft to be made ready, either for a ferry or test flight, will, in his small way, remember how "every second was now to me like another ant coming to devour a man staked to the ground." Of the force of false instinct, he writes: ". . . markless and signal-less for hours had been this desert of air, not one hundred cubic miles differed from any other. Yet always I had flown in one direction until the idea had become stamped in my instinct that the island lay dead ahead. And, now that I had turned almost at right angles to the former course, my whole nature rose in revolt to repudiate such an unwarranted change in mid-ocean." About the work of reconstruction: ". . . Eighteen months previously a whole longeron had had to be renewed because a Government inspector could detect in it, by the aid of a powerful magnifying glass, an otherwise invisible fracture. Poor fellow, not to have a branch office at Lord Howe Island; I must deputise for him. On his behalf, I passed the longeron as good enough . . . the wings, the book said, must be dihedrally rigged 3½ degrees upwards and measured with a variable inclinometer. In other words, must be cocked up at the tips; but when I asked several men to lend me their variable inclinometer, they looked positively shocked." Of the sensations of oceanic flying: ". . . passed through the curtain of rain and entered an immense cavern of infinite space bounded only above by the vault of dull sky, and below by the immeasurable floor of dull water . . ."

Foiled in several attempts to take a more active part in the air war, Francis Chichester, with the exalted rank of Flight Lieutenant, became an Air Ministry navigation expert. Yet the principles which he worked out for himself are identical with some of those used by R.A.F. Bomber Command in its attacks on Germany. One of his plots on the Tasman flight used, in fact, to hang up in the mess of the Empire Navigation School at Shawbury—and probably still hangs there.

H. A. T.

SERVICE AVIATION

NOW IN PRODUCTION: The Firefly IV is a very useful addition to the Navy's list of combat aircraft. Its armament of four cannon, and either 16 rockets or 2,000lb. of bombs, make it one of the most hard-hitting fleet fighters in the world.

Royal Air Force and Naval Air Arm News and Announcements

Awards

Royal Air Force

THE KING has been graciously pleased to approve the following awards, in recognition of gallantry and devotion to duty in the execution of air operations:—

Distinguished Service Order

Act. Wing Cdr. W. A. FORBES, D.F.C., R.A.A.F., No. 463 (R.A.A.F.) Sqn.—This officer has completed a large number of operational missions as captain of aircraft. In January, 1945, he led a force of aircraft to attack the Dortmund-Ems canal in daylight. The results were spectacular, and the canal was drained and put completely out of action. Throughout his two tours of operational duty this officer has consistently displayed outstanding leadership and determination. As a flight and squadron commander he has set an exceptionally fine example, which has been reflected in the efficiency and fine fighting spirit of his unit.

Distinguished Flying Cross

Act. Sqn. Ldr. E. S. FEW, A.F.C., R.A.F.V.R., No. 608 Sqn.*
Flt. Lt. A. D. PELLY, R.A.F.V.R., No. 156 Sqn.
Act. Flt. Lt. H. D. MICHELL, R.A.F.V.R., No. 35 Sqn.
Act. Flt. Lt. I. W. SAUNDERS, R.A.F.V.R., No. 103 Sqn.*
F/O. D. F. SINFIELD, R.A.F.V.R., No. 156 Sqn.*
Act. Sqn. Ldr. J. C. HOLMES, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Act. Flt. Lt. A. P. GREENFIELD, R.A.A.F., No. 61 Sqn.
F/O. A. F. REID, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
P/O. W. K. BENNET, R.A.A.F., No. 69 Sqn.
Sqn. Ldr. H. F. MARCOU, A.F.C., R.C.A.F., No. 156 Sqn.
Act. Flt. Lt. J. P. DUGGAN, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
F/O. A. M. MACKIE, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
F/O. A. J. MCLEOD, R.C.A.F., No. 156 Sqn.
F/O. J. T. ROSS, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
W/O. (later P/O.) E. K. COYNE, R.C.A.F., No. 7 Sqn.

Distinguished Flying Medal

Flt. Sgt. G. E. BOLLANT, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.*
Flt. Sgt. G. A. HEATH, R.A.F.V.R., No. 161 Sqn.*

* *Since deceased.*

Release of Log Books

A QUESTION asked in the House of Commons on February 27th, about the release of log books of deceased aircrew personnel, shows that it is still apparently not generally known that these are now normally available to the next of kin upon application. Any ex-member of an R.A.F. aircrew, or any legal personal representative of deceased R.A.F. aircrew personnel who wishes to obtain a log book for retention, can do so by applying, in the case of officers, to the Under-Secretary of State, Air Ministry (A.R.9 * (b)), Adastral House, Kingsway, W.C.2, or, in the case of airmen, to the Air Officer i/c Records, R.A.F. Record Office, (C.1), Gloucester.

Royal Australian Air Force

THE KING has been graciously pleased, on the advice of His Majesty's Australian Ministers, to approve the following awards:—

O.B.E. (Mil.)

Sqn. Ldr. D. E. SWAN, R.A.A.F.
Act. Sqn. Ldr. N. L. AVERY, R.A.A.F.

M.B.E. (Mil.)

Flt. Lt. H. R. LANGLEY, R.A.A.F.
Flt. Lt. F. P. SMITH, R.A.A.F.
F/O. E. W. LANDGREN, R.A.A.F.

George Medal

Sgt. L. W. WILLIAMS, R.A.A.F.

Royal New Zealand Air Force

THE KING has been graciously pleased, on the advice of His Majesty's New Zealand Ministers, to approve the following award:—

George Medal

Flt. Lt. B. M. de LAMBERT, R.N.Z.A.F.

Army

THE KING has been graciously pleased to approve the following award, in recognition of gallant and distinguished service in the field:—

O.B.E. (Mil.)

Maj. (temp.) J. G. ROSS, D.S.O., The Parachute Regiment, Army Air Corps.

SERVICE AVIATION

New Pay Code for Officers

NEW rates of pay and allowances for officers are the subject of a White Paper which was published last week. It forms a companion paper to the Command Paper which was presented on December 19, 1945, and which dealt with the pay for other ranks. The new rates are planned to remove existing disparities between and within the services, and to establish equality of treatment. They are also aimed at simplifying the pay codes generally, and establishing a suitable level of remuneration for the Service as a profession.

The White Paper provides for only four R.A.F. Branches, the General Duties, the Technical, the Equipment and the Secretarial Branches. Officers of the G.D. Branch will fill flying appointments, and also all command and administrative posts which require flying experience. The Technical Branch is to be established on a permanent basis, and its officers will fill the majority of technical staff posts. Arrangements will be made, however, for officers of this branch to qualify as aircrews. A number of administrative posts which do not call for flying experience are to be transferred to other branches, and, in consequence, the Equipment and Accountant branches will be extended in their scope, the latter becoming known, for the time being, as the Secretarial Branch. The Administrative and Special Duties Branch will not be retained, and many of the duties covered by that branch will be absorbed by the Secretarial Branch. The Medical, Legal, Educational and Chaplaincy service are *not* within the scope of this White Paper.

Commissions from the Ranks

In future, there will be a considerable increase in the proportion of airmen selected for commissions in all branches as compared with the pre-war system. The R.A.F. college at Cranwell is to be reopened for the training of G.D. officers, and candidates who are accepted for training there, will be enlisted as airmen in the regular Air Force. Payment of fees for the course will be abolished.

Officers' promotions, subject to efficiency, will be on a time basis up to the rank of Flight Lieutenant, but promotion to Squadron Leader rank will be by selection.

Pay is claimed to have been fixed at a level which will enable an officer to live without private means, but, as might be expected, there is no very great change in the existing rates for junior officers commissioned at age 20 or 21. Instead, larger increases are provided at the age when an officer might reasonably expect to marry. In the higher ranks, account is taken of increasing family commitments, and of responsibilities of rank—also of the present general trend of professional salaries at these levels.

Taxable Pay and Allowances

In order to simplify the pay code, the same scale of pay will apply to all branches, except for Pilot Officers and Flying Officers of the G.D. Branch who will draw flying pay of 3s per day when employed on flying duties. Most forms of additional pay will be absorbed into the basic rates. Apart from the standard rate of pay for each rank, there will be a scale of increments within the rank, based on the period for which the rank has been held. The rates will be clear from the accompanying table, which also shows the new annual rates of marriage allowance, and a broad indication of the normal average age at which an officer might expect promotion.

Existing systems of marriage allowance are now to be replaced by a composite marriage allowance, which will vary only with rank, but if the married officer occupies married quarters or an official residence, he will have to pay rent and also for fuel and light. The qualifying age for officers for this marriage allowance will be 25 instead of 30 as formerly. The new age limit takes into account the age at which a man in normal civilian life might reasonably be expected to marry, and at the same time it aims at discouraging the young serving officer from undertaking family commitments while he is still learning his profession. However, this age limit of 25 will not apply to a married officer under that age who is already receiving officer's marriage allowances on June 30, 1946, provided that his service continues without a break. Special arrangements will be made for officers in the future who may be married before age 25.

Unmarried officers, for whom Service accommodation is not available, are entitled, at present, to allowances for lodging, fuel and light. These, together with the servant allowance, are to be consolidated into a composite lodging allowance. Other allowances which are dealt with in the White Paper are the field allowance, which is to be abolished, and the ration allowance, which will be on the same scale for all three Services in the future. This ration allowance is not included in the marriage allowance, and is to be exempted from income tax by the introduction of special legislation.

One of the most sweeping changes made by the new scheme is that both the consolidated marriage allowance and the lodging allowance become subject to income tax. The intention is to bring the emoluments of the serving officer on to a basis comparable with civilian salaries, for the White Paper considers it to be anomalous that a substantial part of an officer's income should be free from tax. Thus, with effect from April 6th, 1947, the marriage allowance and lodging allowance will be added to the officer's pay for assessment of income tax. The White Paper agrees that these tax decisions affect considerably the net financial position of officers, but indicates that this factor has been taken into account in determining the new scales of pay.

New Retired Pay

Retired pay has also been reviewed. There are to be standard rates common to all three Services, subject to a normal qualifying minimum period of service from age 21. For example, a Flight Lieutenant must complete 20 years' service for his full standard retired pay rate of £375 per year; a Squadron Leader 22 years for £475 per year; a Wing Commander 24 years for £625 per year; and a Group Captain 26 years for £825 per year. Deductions will be made from the full rates where an officer on compulsory retirement has not completed sufficient service to qualify for the full standard rate. An officer who has not completed sufficient service on retirement to qualify for retired pay will receive, instead, a gratuity of £1,000 for not less than ten years' service, plus a further £150 for each additional complete year of service over ten, subject, however, to a maximum total gratuity of £2,350. Except in the case of invaliding, no gratuity will be payable to an officer who is permitted to leave the Service without completing ten years' service.

The new rates and conditions of pay and allowances will come into force on July 1st, 1946, but officers who were commissioned before that date will have certain temporary benefits. Where the total pay and war service increment of such officers on June 30th, 1946, exceeds the pay admissible under the new code, the difference will be paid as "war excess" until such time as promotion or increment under the new scale completely absorbs this war excess. Thus, no officer's pay will suffer reduction as a result of the introduction of the new code. There will also be a temporary scheme of supplementary marriage allowances for certain married officers whose income will suffer a net loss by the introduction of the new system.

The new retired pay scale becomes effective immediately, but officers on the active list may receive the retired pay and gratuity in respect of their present rank under the old scheme if more to their advantage. The new retired pay scheme does not, however, apply to officers who retired before December 19th, 1945. The position of retired officers who gave full-time service in the recent war is still under examination.

New rates of pay for the Naval Air Arm compare favourably with those for the R.A.F. The basic rates of pay tend to be lower in the Navy than for the equivalent ranks in the R.A.F., but the addition of 3s per day flying pay to Lieutenants and Lieutenant Commanders raises the total pay in these ranks to a figure identical with that of the R.A.F. officer of similar rank.

COMPARISON OF ROYAL AIR FORCE RATES OF PAY UNDER OLD AND NEW SYSTEMS

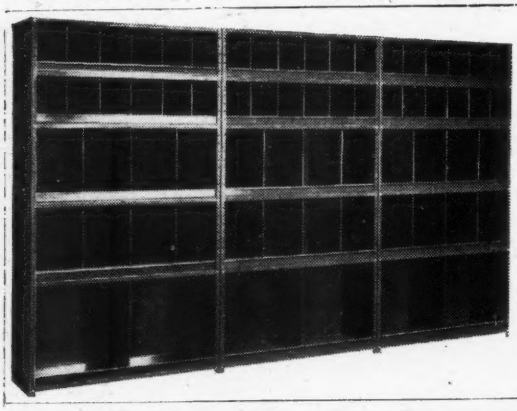
	Average Age Reached!			Present Rates		New Rates			
	General Duties Branch	Technical Branch	Equipment and Secretarial Branches	General Duties and Technical Branches	Equipment Branch	General Duties Branch	Technical, Equipment and Secretarial Branches	Marriage Allowance (Annually)	Total (Annually)
				s. d.	s. d.	s. d.	s. d.	£	£
Pilot Officer ..	20	22	21	14 6	11 10	16 0	13 0	—	—
Flying Officer ..	21	22½	23	18 2	13 6	18 0	15 0	—	—
after 2 years ..	23	24½	25			20 0	17 0	228*	538
„ 3 „ ..			26		16 4		19 0	228*	575
						s. d.			
Flight Lieutenant	23½	25½	27	21 9	19 0	23 0		228*	648
after 2 years ..	25½	27½	29	23 6		25 0		128	684
„ 3 „ ..					20 10			—	—
„ 4 „ ..	27½	29½	31	25 4		27 0		228	720
„ 6 „ ..	29½	31½	33			29 0		228	757
„ 7 „ ..					22 8			—	—
Squadron Leader ..	30	32	34	30 10	29 0	35 0		228	867
after 2 years ..	32	34	36	31 8		37 0		228	903
„ 4 „ ..	34	36	38	32 6		39 0		228	940
„ 6 „ ..	36	38	40	33 4		41 0		228	976
„ 8 „ ..				34 2				—	—
Wing Commander	35	38	41	36 2	33 6	47 6		274	1,141
after 2 years ..	37	40	43	38 8		50 0		274	1,186
„ 3 „ ..					35 4			—	—
„ 4 „ ..	39	42	45	41 2		52 6		274	1,232
„ 6 „ ..	41	44	47	43 8	38 0	55 0		274	1,278
„ 8 „ ..	43	46	49	46 2		57 6		274	1,323
„ 10 „ ..				48 8				—	—
Group Captain ..	40	43	47	49 10	45 4	65 0		274	1,460
after 2 years ..	42	45	49	52 6		68 0		274	1,515
„ 4 „ ..	44	47	51	55 2		71 0		274	1,570
„ 6 „ ..	46	49	53	58 0		74 0		274	1,624
Air Commodore ..	44	48	51	61 0	55 0	77 0		319	1,734
Air Vice-Marshal ..	—	—	—	90 6	75 0	110 0		365	2,372
Air Marshal ..	—	—	—	108 8	—	135 0		365	2,828
Air Chief Marshal ..	—	—	—	126 8	—	160 0		365	3,285
Marshal of The R.A.F.	—	—	—	No rate provided	—	180 0		365	3,650

* Normal qualifying age for Marriage Allowance is 25.

BALL & ROLLER
R&M
BEARINGS

carry loads with frictionless efficiency on both airframe and engines of the "Bristol" Freighter....

RANSOME & MARLES BEARING CO. LTD.
NEWARK ON TRENT ENGLAND



ARE YOUR STORES
ORGANISED FOR
TOTAL PRODUCTION

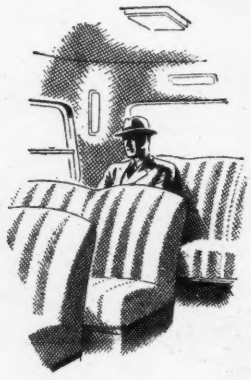
NOT IF YOUR EQUIPMENT
IS OUT OF DATE
FOR BINS, TOOL CABINETS, LOCKERS,
WORK BENCHES, ETC. *Prompt Deliveries.*

STONEHOUSE STEEL EQUIPMENTS
Phone: 0405/6/7 **WEST BROMWICH** Grams: "Steel," W.B.

The SOLUTION
OF YOUR CYCLE
STORAGE PROBLEM

WRITE *for*
CATALOGUE
F.L. 201

CONSTRUCTORS CYCLE PARKS
CONSTRUCTORS LIMITED
NICKEL WORKS TYBURN ROAD
ERDINGTON BIRMINGHAM 24



Peacetime uses of "PERSPEX"

Renowned for its service in aircraft during the war, "Perspex" is now available for essential civilian uses. This transparent, non-splintering material is eminently suitable for passenger transport, not only in the actual vehicles, but also in garages and stopping points en route. It can be used for edge lighting, quarter lights, lighting fittings, draught screens and partitions, and for route indicators and time-table covers. "Perspex" is also supplied in corrugated form for roof-lighting. For full information please write to:

ICI

IMPERIAL CHEMICAL INDUSTRIES LTD.
LONDON, S.W.1
Makers of a wide range of plastics.
"Perspex" is a registered trade mark.

P.188

SALTER
SPRINGS & ROLLER BEARINGS
for Modern Aircraft Production
GEO. SALTER & CO. LTD., WEST BROMWICH

4-W-77

Pressings · Spinnings
Assemblies · Sheet Metal Work

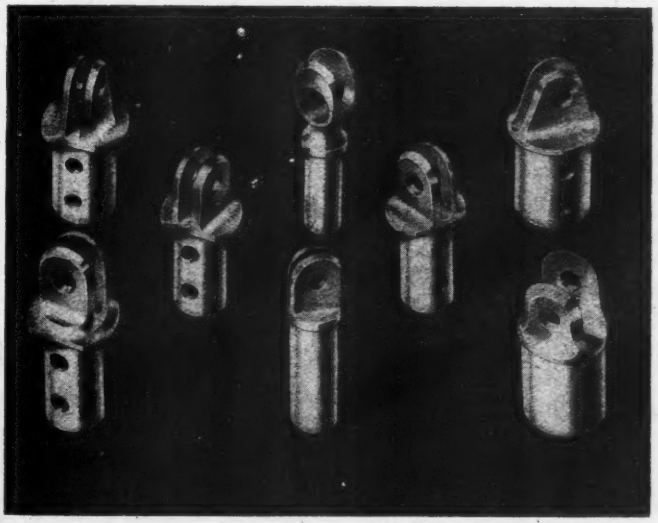
FULLY A.I.D APPROVED

SPECIALISTS WITH EXTENSIVE RESOURCES

Corfield & Buckle Ltd

LONDON

BOLTS AND NUTS, SPECIAL TURNED PARTS



NOW THAT THE WAR IS OVER WE ARE ABLE TO COPE WITH FULL TIME PEACE PRODUCTION OF BOLTS AND NUTS, AND SPECIAL TURNED PARTS FOR THE MOTOR, AIRCRAFT, ELECTRICAL AND GENERAL ENGINEERING TRADES. OUR THIRTY-FOUR YEARS EXPERIENCE IN THE MANUFACTURE OF THESE ARTICLES ENSURES THAT YOUR ENQUIRIES RECEIVE PROMPT ATTENTION, & YOUR ORDERS EXECUTED WITH SPEED & ACCURACY.

RUBERY·OWEN & CO LTD

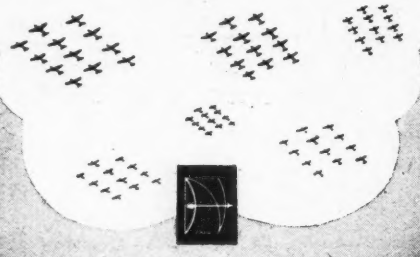
LONDON: IMPERIAL BUILDINGS, 35, KINGSWAY, W.C.2 DARLASTON, SOUTH STAFFS BIRMINGHAM 3: LOMBARD HOUSE, 65, CHARLES ST.

SOUTHAMPTON: 4, ROCKSTONE PLACE. COVENTRY: BRITANNIA WORKS, PAYNES LANE. MANCHESTER: 78, KING STREET.

Bowden

Aircraft Controls

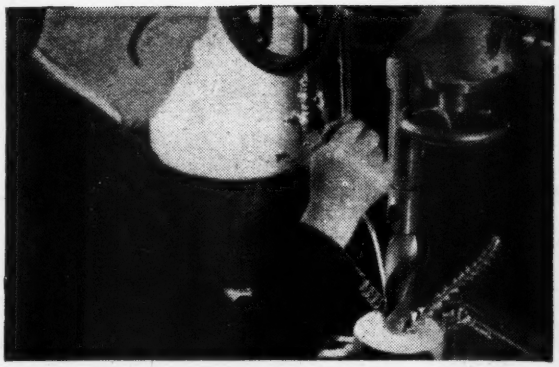
Across the Channel in 1909...



BOWDEN (Engineers) LIMITED

LONDON, N.W.10

40-61



Whatever the Operation ...

Millions of parts requiring accurate drilling or machining, and much of the material being super-tough, puts a constant strain on the small tools being used. Drills, for instance! Apart from the necessary time to time regrinding—which, incidentally, should be very carefully carried out—the drill itself will incessantly, with proper handling, produce accurate holes at a speed relative to the machineability of the material being drilled. Dormer drills and small tools have been well tried under most severe conditions, and no tool leaves the Dormer factory without being inspected and re-inspected throughout its entire manufacture.

DORMER

High Speed Twist Drills, Reamers, End Mills, Slot Drills, T-Slot Cutters, Woodruff Cutters, Counterbores, Hollow Mills and Carbon Twist Drills.

THE SHEFFIELD TWIST DRILL AND STEEL CO. LTD.,
Summerfield Street, Sheffield, England.

'Phone : Sheffield 24137. 'Grams : Proells, Sheffield.

London Office. Thames House, Queen Street Place, E.C.4.

'Phone : Central 7235. 'Grams : Proells, London.

BAKELITE

TREFOIL

REGD. TRADE MARKS

PLASTICS

Information concerning the chemical and physical properties of the above materials is available from

BAKELITE LIMITED

Pioneers in the Plastics World

18 GROSVENOR GARDENS, LONDON, S.W.1

T41G

HARD CHROME FACED
PLUG GAUGES

WE ARE GAUGE SPECIALISTS and can supply plain plug and screw gauges, in either hard chrome or hardened steel. Note, too, that, we undertake the reclamation by chromium deposition of worn and damaged gauges. LONG LIFE, LASTING ACCURACY.

ECS COVENTRY LIMITED

Write for full particulars of ou gauge service.

E.C.S. COVENTRY LTD. 10 MUCH PARK STREET, COVENTRY. PHONES 5297 COVENTRY 60347

Today More Than Ever

SEALED POWER IS VITAL!

In proper sealing lies the secret of maximum power of every energy-producing unit . . . of every engine whatever its purpose. For all engines the modern, scientific sealing means "OSOTITE" . . . a simply applied, liquid compound, impervious to heat, petrol, oil, water, steam and grease, which ensures *in a few minutes* a HIGH PRESSURE GAS, AIR OR WATERTIGHT JOINT.
For use in construction and repairs of every type of engine as supplied for M.A.P. and M.O.S. Contracts.

"OSOTITE"

LIQUID JOINTING

As supplied against Government Contract orders to leading Manufacturers of Motor and Aero Engines.

A SLICK PRODUCT

Write for full details and prices to Dept. "F."

A PERFECT JOINT FOR THESE HIGH PRESSURE DANGER POINTS

Cylinder Heads
Valve Caps
Gear Boxes
Carburettor Flanges
Water Joints
Exhaust Flanges
Crank Cases
Differential Cases

Invaluable for Air Compressors, Suction Plants, Pumps, Refrigerators, etc.

SLICK BRANDS LTD. STAFFORD ROAD, WADDON, CROYDON. Tel.: CROYDON 3171-3172

EASY STARTING
from the A.C. Mains

with the

WESTINGHOUSE

TRANSPORTABLE

ENGINE STARTER

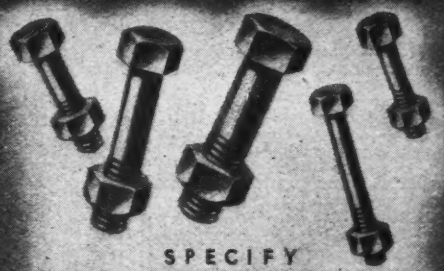
Write for details to Dept. F,

WESTINGHOUSE BRAKE & SIGNAL CO. LTD.

Pew Hill House, Chippenham, Wilts.

BOLTS..
NUTS...

for AIRCRAFT ASSEMBLY AND CONSTRUCTION WORK



SPECIFY

Richards

CHARLES RICHARDS & SONS LTD

Imperial Bolt and Nut Works, Darlaston, Nr. Wednesbury

Phone: Darlaston 140 (5 lines). Wires: "Richards Darlaston"

Home comfort in AIR TRAVEL

Lea Bridge Upholstery can be adapted to individual requirements in design without departing from its essential features of comfort, lightness and durability. Our technicians are available for collaboration with you.

SEATING by LEA BRIDGE

INDUSTRIES LIMITED

SOUTHEND-ON-SEA

Designers and Manufacturers of *Aircraft Seating, Soundproof Panelling, Parachutes and Mae Wests, Inflatable Lifeboats and Dinghies, Barrage and Meteorological Balloons, Flotation Gear and "Airborne" Domestic Upholstery for Airports, Hotels and Clubs.*

THESE SIMPLE PRECAUTIONS REDUCE

industrial DERMATITIS

If correct precautions are taken lost man hours due to industrial Dermatitis can be substantially reduced. First, regular inspection of workers' skin and strict instructions for thorough cleansing. Then at the first sign of irritation an application of D.D.D. Prescription should be made. This soothing, healing lotion quickly penetrates to the root of the trouble below the surface of the skin. Even advanced cases are effectively cleared up by this easily applied antiseptic, it is non-greasy and stainless. Keep a supply in the first-aid cabinet and cut man hours lost through Industrial Dermatitis. From all chemists, 1/5 a bottle. Sample bottle and full particulars sent to executives and welfare workers from D.D.D. Company Ltd (F.3), 3, Fleet Lane, London E.C.4

D.D.D. PRESCRIPTION

ARE YOU ENTRANCED BY A

BOLTON GATE

COLLAPSIBLE STEEL SHUTTER GATES UP TO 50 FEET HIGH

BOLTON GATE COMPANY LIMITED • BOLTON • LANCS.

dm 1237

FLYING SUITS

in fine quality serge, finished drill. Zip fastening front, legs and cuffs. In khaki, white or navy ...47/6
(4 Coupons required)

COMBINATION FLYING SUIT, in super quality fawn gabardine. Heavy fleece lined, zip front, legs, etc., £7.15.0
(18 Coupons)

Fleece lined, zip front and cuffs.

LEATHER and GABARDINE JACKETS, ¾ length.

LUXOR GOGGLES, 50/-. TRIPLEX GOGGLES, from 7/6 and 17/6.

NATURAL SHEEPSKIN GLOVES, lambswool lined, 32/6 per pair. Double texture SILK UNDER-GLOVES, 22/6 per pair. (2 Coupons).

PRICES INCLUDE PURCHASE TAX.
Catalogue on receipt of 1d. stamp.

TURN UNWANTED KIT INTO CASH.
We pay TOP PRICES for *worn* Irvine type jackets, sheepskin lined boots and jackets, leather jackets, flying suits, etc. Call or write. If writing, state full particulars.

D. LEWIS LTD. (Dept. F.)

124, GT. PORTLAND ST., LONDON, W.1
No other London address.
Tel.: Museum 4314. Tele.: Aviakit, Wesdo, London.

Good Progress in the AIRCRAFT INDUSTRY

is open to those who avail themselves of the services of the I.C.S., the world's largest and greatest school teaching by post.

Men who are eligible for the **Air Ministry's Examinations in Categories A, B, C and D** will find the I.C.S. Ground Engineer's Course a sound preparation for success.

We also offer fully adequate instruction to those who wish to enter the **Drawing Office** or to specialise in **Aero Fitting and Rigging** or **Aero-Engine Fitting.** And we have special Preparatory Courses for **R.A.F. Entrants.**

Special terms for members of H.M. Forces

Write to the I.C.S. Advisory Department for booklet of particulars of our Courses in Aeronautical Engineering.

INTERNATIONAL CORRESPONDENCE SCHOOLS, LTD. ICS
Dept. 182, International Buildings, KINGSWAY, LONDON, W.C.2

COTTON BAGS
FOR SPARE PARTS, Etc.
WALTER H. FELTHAM & SON, LTD.,
Imperial Works, Tower Bridge Road,
Telephone: HOP 1784. **London, S.E.1**

Rate 3/- per line, minimum 6/- per paragraph. Special rates: Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders, 4/- per line, minimum 8/- per paragraph. Situations Wanted advts. 3d. per word, minimum 4/-. Box Nos., 4 words, plus 1/-. Press day, 1st post Friday. No responsibility accepted for errors. Remittances payable to :—"Flight" Publishing Co., Ltd., Dorset House, Stamford St., London, S.E.1.

AIRCRAFT FOR SALE AND WANTED

W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1.

CAN offer reconditioned or new aircraft; packing, shipping and insurance arranged anywhere.—Write for particulars to W. S. Shackleton, Ltd. [0070

A. B. GOLAY, 7, Maychurch Close, Stanmore (Middx).

WANTED, 2 Taylorcrafts or similar in fair condition.

FOR sale, 2 Comper Swift, 75hp Pobjoy, with C. of A. [6695

R. K. DUNDAS invite your enquiries for all types of aircraft, engines, accessories or aerodrome equipment.

R. K. DUNDAS offer a Wicko high-wing monoplane, Gipsy Major engine, seating side by side with dual control, fully aerobatic, excellent for private owner or instructional purposes, fully overhauled with C. of A.; £700.

R. K. DUNDAS offer a Stinson Voyager 3-seater cabin monoplane, 85hp Continental motor, under 100 hours, a lovely little machine for getting about in, beautifully fitted and in brand new condition; £850.

R. K. DUNDAS offer a Miles Sparrowhawk single-seater low-wing monoplane, property of test pilot, a beautifully kept and fast sporting machine, innumerable extras, owner going abroad, must sell; £850.

R. K. DUNDAS arrange hire-purchase, insurance, inspection and overhauls.

R. K. DUNDAS, Ltd., The Airport, Portsmouth. Tel. Portsmouth 74874. [0212

FOR sale, new spares for Swallow aircraft, limited supplies available.—Cinque Ports Aviation, Ltd., Sandy Lane, Oxted, Surrey. [6698

MARSHALLS' FLYING SCHOOL, Ltd., for new and second-hand aircraft; part exchanges; sales and service repeat service.—The Airport, Cambridge. Tel. 56291. [0245

AIRCRAFT urgently required for training and charter work, with or without C. of A.; highest prices paid.—Brevet Flying Club, Ltd., 11, Chesterfield St., Mayfair W.1. Gro. 1353 & 1417. [0249

CECIL KAY AIRCRAFT, Ltd., 10-20, Essex St., Birmingham, are Midland distributors for Auster and Percival aircraft; place your order now for early delivery; demonstrations can now be given. [0233

PRENTICE AIR SERVICES (IPSWICH), Ltd., Taylorcraft distributors since 1937, now offer Auster 2- and 3-seaters, early delivery; large stock of Taylorcraft and Piper Cub spares.—St. Mildred's Chambers, Cornhill, Ipswich. [6648

KENNINGS, Ltd., Taylorcraft, Auster and Percival Proctor distributors, are in a position to give demonstrations to prospective purchasers.—Full details obtainable from the distributors, Kennings, Ltd., Queen St., Derby. Tel. 3636. 232, Cheetham Hill Rd., Manchester. Tel. Bla. 9111. [0235

AIR CHARTER

MARSHALLS' FLYING SCHOOL, Ltd., Cambridge, for comfortable air travel; taxi and charter aircraft from 3-8 seats; write or telephone for further details.—Marshalls' Flying School, Ltd., The Airport, Cambridge. Tel. 56291. [0246

AIRCRAFT TRANSPORT

LEP TRANSPORT, Ltd., leading transport packing, shipping and salvage contractors to Air Ministry, M.A.P., and Aircraft Manufacturers and Operators. Air freight specialists.—Sunlight Wharf, Upper Thames St., E.C.4. Central 5050 (18 lines).

AERONAUTICAL ENGINEERS AND AGENTS

R. K. DUNDAS, Ltd.—Aeroplanes, engines, aeronautical equipment and accessories; agents, at home and abroad, for the Aircraft and Allied Industries; branches and agents throughout the world.—Head Office: Airport, Portsmouth 74874. [0214

BIRTHS

HURLE-HOBBS.—On March 3rd, 1946, in Malta, to Ida, wife of Lieut. (A.) Basil Hurle-Hobbs, R.N., a son. [6688

MILBURN.—On February 21st, 1946, at "Montfiere," Abbotsleigh, Hatton, Ceylon, to Barbara Jeanne, wife of Wing Commander J. M. Milburn, D.S.O.—a son. [6705

BOOKS, ETC.

"FLIGHT," Jan. 1, 1942-Dec., 27, 1945, complete; offers?—Watson, Walker Lane, Preston. [6673

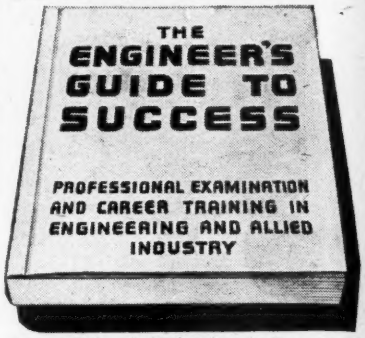
THE Chichester sun compass is a simple but scientifically accurate device which enables the user to tell his direction by the sun, provided the date and local time are known; it is designed for use anywhere in a belt round the world within 200 miles north and south of a line Birmingham to Berlin; 5/3 post free. —Publishers, Allen & Unwin, 40, Museum St., London, W.C.1. [6667

INSURANCE

BOWMAN & SONS, Ltd., Incorporated Insurance Brokers, for many years specialists to personnel of the flying services and civil aviation; departments life and house purchase, fire and motor, aircraft and flying risks.—78, Buckingham Gate, S.W.1. Tel. Whitehall 2491. [6574

FIRST PLACE COURSES

THIRTY-SEVEN FIRST PLACES have been gained by the home-study students of the T.I.G.B. in the A.F.R.Ae.S. Examinations of the Royal Aeronautical Society—a great and unapproached record.



Aeronautical and Engineering Students should particularly note that both Government and Industry have publicly stated that young men with technical knowledge and qualifications are to receive every chance of rising to the highest positions within their capacity in post-war industry. Write to-day for "The Engineer's Guide to Success"—free—and use the FIRST PLACE COURSES of the T.I.G.B. to obtain qualifications and success.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN,
37, Temple Bar House, London, E.C.4.

"ENGINEERING OPPORTUNITIES"

IMPORTANT GUIDE

This unique handbook, "Engineering Opportunities," outlines over 200 Courses of technical instruction, including **Aeronautical Engineering, Aeronautical Design, Aero Engines, Air Navigation, Ground Engineers' Licences. A.F.R.Ae.S., A.M.I.Mech.E., R.A.F. Maths.,** etc., etc. Our Courses have been approved by the **Royal Aeronautical Society** and

WE GUARANTEE
"NO PASS—NO FEE"

A copy of this enlightening guide to well-paid posts will be sent on request—**FREE.**

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY
306, Shakespeare House, 17-19, Stratford Place, London, W.1.

Scott MOTOR CYCLES
Incomparable for Design, Performance and Value.
the SCOTT MOTOR CYCLE CO., SHIPLEY, Yorks.

METAL BODIES • UNEQUAL BRASS UNIONS

to the specific requirements of our customers.

Bar Repetition Products made specially to Air Ministry Requirements

Makers of all types of repetition products from the bar in all metals.

M·C·L and REPETITION LTD. Pool Lane, Langley, Birmingham.

SITUATIONS VACANT

THE COLLEGE OF AERONAUTICS.

THE Board of Governors invites applications for posts as senior lecturers and lecturers in the College of Aeronautics; the salaries offered are from £500 to £1,000 per annum in the case of senior lecturers, and from £350 to £500 per annum in the case of lecturers, depending on ability and experience; applications should be sent not later than May 30th, 1946, to the Registrar, College of Aeronautics, Cranfield, Bletchley, Bucks, and should be accompanied by a full statement of knowledge and experience and the names and addresses of three referees; candidates are required for each of the three departments of the College, namely, aerodynamics, aircraft design and aircraft propulsion.

FOR further guidance a list is given below of the subjects which have to be covered by the lecturing staff.

AERODYNAMICS at high subsonic and at supersonic speeds; general physics including electronics; general aircraft performance; theory of elasticity and structures; general aircraft design; materials and metallurgy, with special knowledge of the properties at high temperatures; design of jet engines, including the aerodynamics of compressors and turbines; engine dynamics, with special reference to vibration; mathematics, especially physical applications.

APPLICATIONS are also invited for the post of junior librarian to the College at a salary of £300 to £450 per annum; applicants should have a good knowledge of British and foreign aeronautical literature and preference will be given to one having also a taste for general literature.

ALL the above posts will carry superannuation on the F.S.S.U. scheme, the holder of the post paying 5% of his salary as premium and the College contributing 10%. [6696

INSTRUCTOR for oxy-acetylene welding, with some knowledge of electric.—Box 7169, Armstrong-Warden, 69, New Oxford St., W.C.1. [6654

PILOT for charter work, holding second class navigator's certificate; apply, stating full particulars and salary expected.—Box 6491, c/o *Flight*. [6682

MALE fabric workers, ex-R.A.F. required for aeronautical engineers in North-West area; give full details of experience and age.—Box 6429, c/o *Flight*.

MOTOR transport mechanics wanted for large motor transport haulage, repair and storage depot.—Marshalls Flying School, Ltd., The Airport, Cambridge. Cambridge 56291. Please mark envelopes "Mechanics." [6646

HYDRAULIC engineer with first-class technical education and preferably some hydraulic press experience, required for development work by Midland engineers.—State age, full details of education, experience and salaries earned, to Box 6430, c/o *Flight*.

EXPERIENCED senior draughtsmen and stressmen wanted; also weight estimators and research technicians.—Apply, giving full particulars of qualifications, experience, age and salary required, Labour Manager, Vickers-Armstrongs, Ltd., Weybridge. [6645

SENIOR aircraft draughtsmen required urgently for experimental drawing office, interesting work with permanency for right type of man.—Write, stating age, full details of experience and salary required, to Personnel Manager, D. Napier & Son, Ltd., Luton Airport, Beds. [6684

DRAUGHTSMAN, senior, experienced in the design of small high efficiency gear boxes and similar components, some knowledge of low-voltage electrical practice an advantage.—Write in confidence, stating age, experience and salary required, to Box 6431, c/o *Flight*. [6672

PRODUCTION controller required by aircraft manufacturing co., to be responsible for progress dept., material control, stores and sub-contracts; previous experience of production control in an aircraft establishment essential.—Write, stating age, experience, qualifications, salary required, to Box 6569, c/o *Flight*.

GLOSTER AIRCRAFT Co. require 1st class aircraft design draughtsmen and 1st class aircraft draughtsmen; permanent posts and ideal working conditions.—Applicants should make written application, giving fullest details of experience and qualifications, to Labour Manager, G.A.C., Hucclecote, Glos.

DESIGNER draughtsmen and senior detail draughtsmen required for engine work, applicants should have had experience in this class of work or in the automobile, diesel or marine engineering industry; applications will also be considered from draughtsmen having first class mechanical experience.—Applications should be addressed to the Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middlesex. [6686

APPLICATIONS are invited from suitably qualified men for the post of Technical Assistant (London area), to investigate aircraft engine vibration problems; applicants must possess a B.Sc. Degree or its equivalent and have had at least three years' practical experience of vibration work.—Applications, stating age, qualifications and salary required, should be addressed to Box A.B.55, c/o 5, New Bridge St., London, E.C.4. [6653

THE British Overseas Airways Corporation invites applications for the following posts at their overhaul factory at Croydon Airport: Carpenters, upholsterers, spray painters, radio mechanics, instrument mechanics, turners, sheet metal workers, bench and aircraft fitters; rates of pay from 2/3½ per hour (in accordance with trade union agreement).—Applications, giving full details, should be sent to Personnel Officer, Croydon Airport, Surrey. Only candidates required for interview will receive reply. [6699

TECHNICAL sales representative for leading manufacturer of specialised electrical equipment for aero engines; qualifications must include theoretical knowledge and practical experience of air- and liquid-cooled engines and their equipment; knowledge of gas turbines an advantage, but not essential; the successful applicant must possess a personality and initiative.—Write, stating age, qualifications, experience, salary required, to Box 6570, c/o *Flight*. (Preference will be given to an ex-R.A.F. engineer officer.) [6703

AT WAR
We are proud to have repaired 2827 Aircraft for the R.A.F. and the Royal Navy

AT PEACE
We offer a complete experienced Aeronautical Service to Charter Operators, Flying Clubs & personal plane owners

1 Sales and Part Exchange
2 Conversions of Service Aircraft
3 Modifications and Special Installations
4 Certificates of Airworthiness Overhauls
5 Engine Overhauls
6 Contract Servicing

Repairers Approved by The Royal Aero Club

Prototype Construction | *Approved design Organisation*

PORTSMOUTH AVIATION LIMITED
THE AIRPORT, PORTSMOUTH · Tel Portsmouth 74374

Aero & Jig & Tool Draughtsmen in Great Demand

MEN AND YOUTHS

There is an insatiable demand for Aero, Jig and Tools, etc., Draughtsmen and Inspectors. So acute is the present shortage that employers are only too anxious to engage those with no previous practical experience who are able to prepare neat and accurate drawings.

QUALIFY AT HOME—IN SPARE TIME

After brief, intensely interesting study—undertaken at home in your spare time—***YOU*** can secure an attractive and interesting post as **Aero-Draughtsman.** Numerous vacancies are also available in **Electrical, Mechanical, Plastics,** etc., branches of Draughtmanship.

FREE GUIDE

The Free Guide contains 132 pages of information of the greatest importance to those seeking such success compelling qualifications as **A.M.I.Mech.E., A.F.R.Ae.S., A.M.I.P.E., A.M.I.E.E., Matric. and B.Sc.,** etc., also **R.A.F. Entry** (Maths., etc.), together with particulars of our remarkable Guarantee of

SUCCESS—OR NO FEE

Write now for your copy of this remarkable publication. It may well prove to be the turning point in your career.

NATIONAL INSTITUTE OF ENGINEERING

(Dept. 427), 148-150, HOLBORN, E.C.1

(South Africa Branch E.C.S.A., P.O. Box 8417, Johannesburg.)

SITUATIONS VACANT—*contd*

PILOT, immediately, for internal airline, beginner not objected to one with R/T. and/or W/T. preferred; apply, stating full particulars and salary expected.—Box 6492, c/o *Flight*. [6683

APPLICANTS are invited for the following positions in India: One technical assistant to Chief Engineer and also Superintendents for Inspection, air frame overhaul and engine overhaul departments; applicants should, preferably hold ground engineers' licences in the appropriate categories.—Box 6314.

DEVELOPMENT engineers required by London firm to assist in the development of fuel injection equipment, some knowledge of aero engine fuel systems preferred, age 25-35, salary according to age, qualifications and experience.—Write, giving full details of experience, training, age, etc., to Box 6565.

APPLICATIONS are invited, from University graduates in engineering or science with research experience, for positions as research engineers and applied mathematicians in the aerodynamic, hydrodynamic, engine, structures and instrument laboratories and flight research establishment of the National Research Laboratories, Ottawa, Canada. Initial salaries range from $2,820 to $4,400.

APPLICATION forms and particulars of specific appointments will be mailed on receipt of letter indicating field in which interested and outlining qualifications.—Address: Chief Scientific Liaison Officer, National Research Council, Canada House, London, S.W.1. [6678

NAVIGATION instructor required for progressive coaching school, ex-R.A.F. aircrew instructor with master's or extra master's certificate preferred but not essential; only those with highest qualifications need apply; salary £400 to £700 per annum according to ability. Also vacancy for chief instructor.—Reply, with brief summary of Service history, flying hours, nautical experience, copies of testimonials, and whether application is for post of chief or junior grade instructor.—Box 6189, c/o *Flight*. [6679

SITUATIONS WANTED

DRAWING office records clerk desires change, considerable aircraft experience, conversant with modern procedure.—Box 6568, c/o *Flight*. [6701

EX-R.A.F. engine fitter requires position, previous experience 6½ years, British and American engines, keen to carry on aero engine work.—Box 6490.

EX-AIR Ministry radio and electrical technical instructor seeks similar or executive post, experienced with aircraft and ground station equipment.—Box 6137, c/o *Flight*. [6610

R.A.F. pilot, F/O., 1,600 hours, married, age 25, demob. group 33, seeks post in aviation, flying or ground; will learn anything leading to advancement.—Box 6427, c/o *Flight*. [6668

AERONAUTICAL engineer, A.F.R.Ae.S., works and University trained, six years aerodynamicist, seeks responsible position giving scope for initiative and ability.—Box 6455, c/o *Flight*. [6677

OVERSEAS.—Aero, mech and marine engineer, extra chief cert., unique experience, used to handle foreign contracts, own secretary, University educ., linguist, seeking position abroad.—Box 6289

APPRENTICED engineer (33), A.R.Ae.S., married, secondary education, keen and ambitious, 6½ years' inspection all types aircraft, 2 years jet aircraft, seeks position with prospects.—Box 6428, c/o *Flight*.

EXECUTIVE, 31, desires change, wide experience of production control methods in aircraft industry (planning, progress, material control, plant load, stores, records, etc.); West Country preferred.—Box 6286, c/o *Flight*. [6634

GROUND engineer, A.R.B. licensed parachutes, dinghies, urgently requires post, any capacity, good clerical knowledge, experienced chauffeur, teetotaller, single, travel, fly anywhere, excellent references.—Box 6567, c/o *Flight*. [6700

JET propulsion.—Foreman, fitting and assembling, requires post, complete knowledge of fitting, subassemblies and assemblies on Whittle design gas turbines, also axial flow compressors; references furnished; strict disciplinarian; age 34.—Box 6571, c/o *Flight*.

FLIGHT LIEUTENANT released in two months, 1,200 hours single engine experience, Typhoons, Spitfires, Hurricanes, Harvards, Masters, operational, advanced flying instructor U.S.A., interested air taxi work anywhere, particularly S. America.—Box 6453.

EX-R.A.F. fitter II eng., Class A release, single, age 26, seeks position with prospects and scope for improving technical qualifications, civil or commercial aviation, enthusiastic, keen, reliable, five years' experience maintenance work, various engines.—Box 6113, c/o *Flight*. [6674

CHIEF storekeeper, progress dept., and buyer for aircraft repair contractors, fully conversant M.A.P. 705 procedure and A.I.D. requirements; age 37; six years' experience; own car; seeks position with prospects and where initiative can be used; available shortly.—Box 6566, c/o *Flight*. [6691

FLT.-LT., pilot (26), now on release leave, keen on civil aviation, requires flying position, 1,200 hours Catalina and Sunderland, plus 300 hours single engined landplanes, entirely accident-free record, ex Coastal Command and Air Sea Rescue, getting "B" license, experience flying conditions U.K. to China.—Box 6488, c/o *Flight*. [6680

RELEASED R.A.F. Sgt. F II.A, age 26, single, eight years' service, experienced servicing, repair, inspection, training, operational aircraft, assembly British, American aircraft, ground admin., seeks position civil aviation, club, private owner or any job with prospects, available immediately, go anywhere in world, four years' experience South Africa.—Box 6454, c/o *Flight*. [6676

CAR HIRE SERVICE

FORCES personnel on leave from abroad requiring cars should apply to Wilson's (Brixton), Ltd., Trinity Gardens, London, S.W.9. Brixton 4011. [0228

CARS WANTED

CARS bought for cash, any condition.—Wilson's Coachworks, 16, Trinity Gdns., S.W.9. Brixton 4011

WANTED

WANTED to purchase, large quantities offcuts, various sizes, thicknesses, against licence.—Box 5626, c/o *Flight*. [6518

W.B.Bawn

Sheet Metal Work • Steel Plate Work • Fabricated Welded Steel Work in any thickness • Profile Gas-Cutting • Hydraulic Press-work • Engine Test Beds • Machine-Shop Work • A.I.D. approved

ENGINEERS AND CONTRACTORS

Byron Works • Blackhorse Lane • London, E.17

Phone: LARkswood 4411-3 *Grams: Bopeep, Walt, London*

& COMPANY, LIMITED, FOR HEAVY METAL WORK

FLYING TRAINING

CAMBRIDGE AIRPORT offers the best flying instruction and training facilities obtainable.

Dual and Solo hourly rates :

	Day	Night
Tiger Moth	£4 0 0	£5 0 0
Auster J.I...	£4 0 0	£5 0 0
Messenger	£5 0 0	£6 0 0
Proctor V...	£6 10 0	£8 10 0
Rapide ..	£10 10 0	£12 10 0

★ Flying charges are inclusive of ground instruction and lecturing on all subjects for Pilots' "A," "B" and Instructors' certificates.

★ No entrance fee or annual subscription.

★ Aerodrome 2 miles from centre of Cambridge.

★ First-class aerodrome restaurant.

★ Self-drive hire car service.

★ Aircraft sales and service.

★ Air charter and taxi.

MARSHALLS FLYING SCHOOL

LTD

THE AIRPORT

TEL. • CAMBRIDGE • 56291

WINDSCREEN WIPERS FOR AIRCRAFT

THE HOUDAILLE HYDRAULIC SUSPENSION CO. LTD.

8/14, HAMPTON ROAD, TWICKENHAM, MIDDLESEX

Telephone: Popesgrove 6284

Kilfrost

for all

De-icing problems.

KILFROST MANUFACTURING CO. LTD.

1 St. Nicholas Buildings, Newcastle-on-Tyne.

Telephone: 20448-9.

Works:—Haltwhistle, Northumberland.

Telephone: Haltwhistle 332.

MISCELLANEOUS

AIRCRAFT souvenirs.—Solid brass scale castings, 56 British, U.S.A., types.

SUPPLIED unfinished for filing & polishing; transparent plastic display stands, propellers, transfers, etc.; also chrome finished models, mounted on stands, complete for presentations & gifts; send 2½d. stamp for list; goods sent to Services abroad.—Gibb, 153, Oxford St., Glasgow. [6547

MONOMARK; permanent London address; letters redirected; 5/- p.a.—Write BM/MONO88, W.C.1.

R.A.F. officers' uniforms purchased; new and reconditioned kit for sale.—Fishers, 88, Wellington St., Woolwich. Tel. Woolwich 1055. [0196

TYRES.—Sound second-hand tyres, 16s, 20s, 30×5, 30×6, 34×7, etc.—Willow Bank Motors, Sipson Corner, Bath Rd., West Drayton, Middx. Tel. West Drayton 2949.

FOR sale, R.A.F. officer's uniform, greatcoat, battledress, mess kit, including tropical jacket, all perfect; chest 38, inside leg 31, 6ft.—Box 6564, c/o

A METEOR for sale, also Lancastrian; two of our many fine scale-model white-metal castings; w/spans, 6in-12½in; ash trays, etc.; lists; send s.a.e. —Kenmore's, 280, Nth. Circular Rd., London, N.W.10.

A LIMITED number of 1/12hp electric motors, ideal for extractor fans or ventilation fans, 12 volt or 24 volt, size 3¾in high, 4¾in wide, 4½in long, weight 4¼lb., very strongly made; price, including carriage, 35/-.—Ward, Anchor Cottage, Shepperton, Middlesex. [6692

A LIMITED number of sturdy ¼hp electric motors, mounted on stout frame and supplied with driving pulley, can be supplied either 12 volt or mains ac, 1,700-2,000 revs., ideal for driving small tools, pumps, etc.; size 6½in high, 6¼in wide, 11¼in long, weight 35lb.; £4, carriage paid, purchasers' risk.—Ward, Anchor Cottage, Shepperton, Middlesex. [6693

THE new Eccles "Enterprise" caravan, 14ft 9in long, treble panelled, one double and two single berths, two tables, two wardrobes, end kitchen, oil cooking; price £431 plus £122/17/4 (P.T. will be refunded if Government decides it is not due); hire purchase deposit £185 and 24 monthly payments of £17/10 approx.; gas cooking and lighting £25, antracite stove £25; delivery from stock.—On view (and also centre kitchen model) at F.O.C. Caravan Centre, 206, Cricklewood Broadway, N.W.2. Gladstone 2234; also 30 second-hand models in stock. [0207

OILSKINS free of coupons.—Surplus from public utility company, and reconditioned as new; suit consists of heavy black oilskin ¾ length coat, shoulders interlined, button to neck, with storm collar, also heavy black oilskin trousers, guaranteed absolutely waterproof; price 35/- per suit, postage 1/- extra; sou'wester to match, 3/- extra; all sizes orderable; state chest and waist measurement when ordering; limited supplies; cash back if dissatisfied; also A.R.P. yellow oilskin coats, full length, 15/6.—Willson Brothers (Dept 14), Epsom, Surrey. [0234

PATENTS

THE proprietor of British Patent No. 517775, entitled "Aircraft Construction," offers same for license or otherwise to ensure practical working in Great Britain.—Inquiries to Singer, Ehlert, Stern & Carlberg, Chicago, 4, Illinois, U.S.A. [6666

PUBLIC ANNOUNCEMENT

ROYAL Aircraft Establishment.

EXAMINATIONS for the entry of

(A) Engineering apprentices,
(B) Craft apprentices,

WILL be held at the above establishment for

(A) On Friday, May 3rd, 1946, and
(B) On Friday, May 10th, 1946.

SELECTION is by open competition followed by interview, and candidates may enter for either or both examinations.

Candidates for (a) must, in general, be between 15 and 17 years of age, and must be educated up to School Certificate standard, and for (b) 14 and 16 years of age on September 1st, 1946.

Application forms and full particulars relating to conditions of entry, training and service, together with examination syllabus, may be obtained from the Director, Royal Aircraft Establishment, Farnborough, Hants, to whom applications on the prescribed form must be returned on or before April 20th, 1946.

CONSULTANTS

CONSULTANT scientist specialises in unusual problems.—Enq. invited, trade or private.—Box 5752.

S. J. NOEL-BROWN & Co., the Industrial Management Consultants, and their Associates are now in a position to consider forward contracts and assignments, home or overseas, in regard to production and material control and time and motion study; general investigation and contractual services are available at short notice.—Gt. Peter House, 2, Lord North St., Westminster, S.W.1. Tel. Abbey 2126 (5 lines). Grams, Gayfere Sowest, London. [0210

HOTELS AND ACCOMMODATION

ROYAL OAK HOTEL, Keswick-on-Derwentwater, heart of English Lake District; offers restful holiday to Air Force personnel; first-class accommodation at reasonable charges. [0814

HOLYWELL Bay Hotel, Cubert, Nr. Newquay, Cornwall. Tel. Crantock 242. 40 bedrooms, h. & c., licensed; overlooking the sea, excellent surf bathing, sandy beaches, etc.; book early for Easter and summer.—Proprietor, Sqdn. Ldr. A. L. Duke.

PACKING AND SHIPPING

R. & J. Park, Ltd., 143-9, Fenchurch St., E.C.2. Tel. Mansion House 3083. Official packers and shippers to the aircraft industry. [0012

PERSONAL

LEADERS in the aircraft industry read "The Recorder." [0222

"TOM LONG'S superb—a joy to light"—Smokers' judgment's always right. [0026

COLLEGES of Automobile & Aeronautical Engineering, Chelsea. Old students' reunion dinner, Gt. Eastern Hotel, Liverpool St. Station, E.C.2. Saturday, 18th May. Tickets 17/6. Numbers limited.—Apply Secretary, College House, Princes Way, S.W.19.

REPAIRS, WELDING, ETC.

MARSHALLS' FLYING SCHOOL, Ltd., offer full facilities for servicing repairs and C. of A. overhauls for civil aircraft.—The Airport, Cambridge. Tel. 56291. [0247

TIME RECORDERS

TIME recorders.—Service rental. Tel. Vigilant 4731.—Time Recorder Supply and Maintenance Co., 28, Mayfield Rd., Sutton, Surrey. [0196

STAFF time checking and job costing time recorders (all makes) for quick cash sale; exceptional condition.—Box 7020, c/o *Flight*. [0040

TUITION

ARE you a Service pilot? Then why not qualify for your B? Success guaranteed.—Box 6330, c/o

COLLEGE OF AERONAUTICAL ENGINEERING (of Chelsea), College House, Princes Way, Wimbledon Park, S.W.19 (Put. 4197).—Practical training for civil aviation. Syllabus from Bursar.

AIR Transport College, Ltd., now offer specialised training for Pilot's "B" and Navigator's licences. —Write for Pilot's "B" Booklet, to Air Transport College, Ltd., Dept. P.B.F., 2, Drapers Gardens, London, E.C.2. [0227

WIRELESS telegraphy.—Postal courses of instruction for P.M.G. certificates for Merchant Navy and Air Ministry for Civil Aircraft.—Apply British School of Telegraphy, Ltd., 179, Clapham Rd., London, S.W.9. (Brixton 3847.) Estab. 36 years. [0218

FLYING tuition on Tiger Moth aircraft available now; aerodrome only 2 miles from the town, with full restaurant and club facilities; qualify for your Pilot's A, B and/or Instructor's Licence at Marshall's Flying School, Ltd., The Airport, Cambridge. Tel. 56291. [0244

WORK WANTED

CAPACITY immediately available on centreless grinder up to 1in dia., capstans up to 1¼in, turret lathes up to 3½in dia., horizontal and vertical milling machines and drill presses; facilities for gas and arc welding and repetition brazing and soldering; full A.I.D. approval.—Box 6347, c/o *Flight*. [6658

GOVERNMENT RELEASE

OILSKIN SETS

FREE OF COUPONS **15/-** Postage 6d. extra

Ex A.R.P. Yellow Oilskin Sets consisting of ¾-length Jacket, slip-on Trousers and Sou'wester. Absolutely Waterproof and affording complete protection in heaviest rain. Jacket buttons to neck with overflap down front for additional protection. Suit can easily be carried in Cycle Bag when not in use. An absolute bargain which cannot be repeated. POST ORDERS ONLY. Cash back in full if in any way dissatisfied.

WILLSON BROTHERS

Government Surplus Clothing Contractors.

(Dept. F), EPSOM, SURREY. *'Phone: Epsom 1293*

WANTED

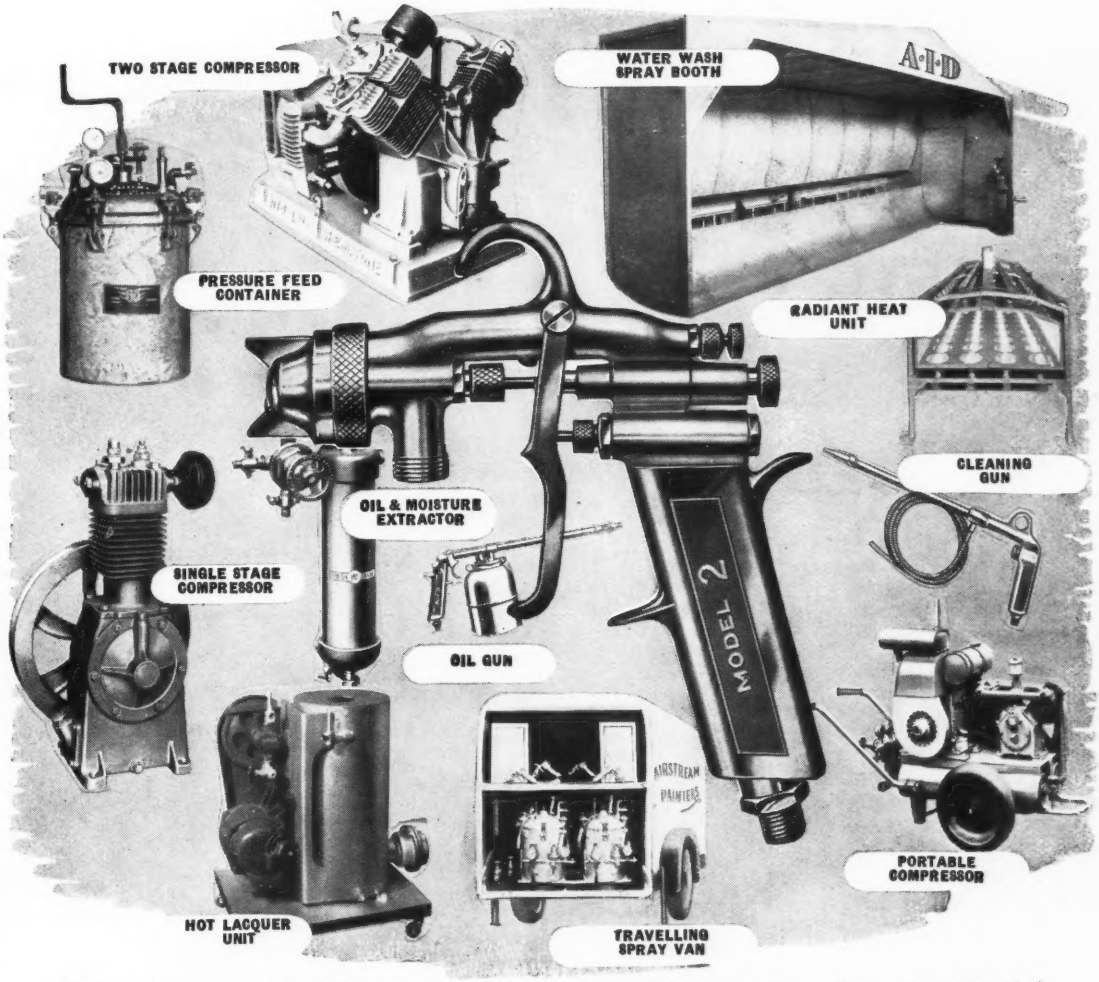
"FLIGHT," 1940 to 1945 complete.

Offers to:

WM. DAWSON & SONS, LTD.,

102, WIGMORE ST., W.1. *Welbeck 8433.*

The GUN
and Everything Behind It



Behind the incomparable A.I.D. Spray Gun is compressed air equipment of every conceivable type, of the highest quality yet devised, for paint spraying and for other industrial finishes. This equipment has won its spurs during recent hostilities . . . proved its superiority on British aircraft, transport, and other munitions of war in a way which can leave no shadow of doubt as to its exceptional dependability and fitness for purpose intended. A.I.D. Compressed Air Equipment is fully adaptable to all peacetime requirements. In each industry it provides appliances and components of the most comprehensive and highly specialised type, plus a spares and maintenance service covering the entire country. Write us . . . let us plan and design your finishing department.

A·I·D
COMPRESSED AIR EQUIPMENT

Sole Manufacturers :
AIR INDUSTRIAL DEVELOPMENTS LIMITED, Aidspray Works, Shenstone, nr. Lichfield, Staffs. Phone : Shenstone 274/5.
Grams : Aidspray, Shenstone. London Office : 28, South Molton Street, W.1. Phone : Mayfair 6318.
Scientific A 12

"Bristol"

SLEEVE-VALVE

RADIAL ENGINES

CENTAURUS

18-cyl. sleeve-valve engine developing over 2,800 B.H.P.

HERCULES

14-cyl. sleeve-valve engine developing 1,800 B.H.P.

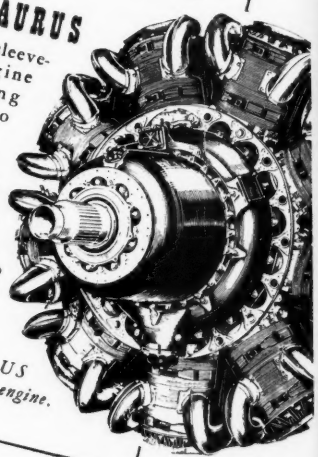


Illustration shows: the CENTAURUS *18-cyl. sleeve-valve engine.*

"there goes the 7.20 from Prestwick" . . .

With the growing acceptance of punctuality and reliability as common-place parts of civil airline operation, power units with those virtues—to the highest composite degree—essential for efficient civil airline operation receive justifiable recognition. In the "Bristol" single sleeve-valve engine, you have a power unit which gives a favourable reply—on a comparative basis—to any major operational question—is it reliable? . . . . yes, there is so little to go wrong with the single sleeve-valve principle. Is it economical? . . . . yes, comparisons show it to be exceptional in this respect. Is it easily maintained? . . . . simplicity in principle automatically provides simplicity in servicing. These answers give the main reasons why "Bristol" single sleeve-valve engines power so many current-production civil aircraft.

"Bristol"

pioneered and developed the single sleeve-valve principle

THE BRISTOL AEROPLANE COMPANY LIMITED

Printed in England for the Proprietors, FLIGHT PUBLISHING COMPANY LIMITED, Dorset House, Stamford Street, London, S.E.1, by THE CORNWALL PRESS LTD., 1-5, Paris Garden, London, S.E.1
"Flight" can be obtained abroad from the following: AUSTRALIA and NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: Imperial News Co., Gordon & Gotch, Ltd SOUTH AFRICA: Central News Agency, Ltd., Wm. Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co. Entered as Second Class at the New York, U.S.A., Post Office.